Projected Residential Electricity Demand After Subsidies Reform Program In Iran

Mehdi Sadeghi Shahdani[1],Zohreh Salimian [2],Majid Aghaee[2],Vahab Mokarizadeh[2]

[1]Economics Department of Imam Sadegh University, Iran, +982188081404, sadeghi@isu.ac.ir
[2] Niroo Research Institute, Iran, +982188079396, zsalimian@nri.ac.ir, vmokarizadeh@nri.ac.ir

Overview
At present, removal of the corresponding subsidies in various subsectors, particularly in residential sector, is of the most important challenges, which are about to happen in energy sector in Iran. In this regard, subsidies of all energy carriers including electricity, natural gas and other fuels will be removed and the prices will be increased to the production cost over a five-year plan, which lasts until 2014. Consideration of the effects of this cost increase on the residential electricity demand is of crucial importance, due to which this study is conducted.

Methods
This paper is generally focused on the effect of increase of energy prices on residential electricity demand in Iran based on the estimation of GMM Model and calculating price elasticity of demand, which is a function of electricity consumption, electricity price, gas price, heating and cooling degree days and household consumption expenditures. Afterwards, the coefficients of this function are obtained using time series from 1967 to 2008. Sensitivity analysis of the results in hypothesized scenarios are the subjects of the remaining parts of this paper. It should be mentioned that we generate scenario forecasts of electricity demand in three cases with respect to rates of economic growth namely, reference, medium and high growth represents 2.67%, 4.6% and 7% annual real GDP growth. In addition, we assume that energy prices will start increasing to production cost levels to analyze the impact of subsidy reforms on electricity consumption in residential sector.

Results
We perform GMM estimation on two versions of the following abbreviated model with parameters:

$$Ln(ED_t) = c + \alpha_d LnED(-1) + \alpha_e Lnp_e + \alpha_g Lnp_g + \alpha_{hdd} LnHDD + \alpha_{cdd} LnCDD + \alpha_{hc} LnHC$$
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Where:

$Ln(ED_t)$, $Ln(ED_t(-1))$	Log electricity consumption in million kWh (-1 indicates the lag term)
p_e	Log real electricity price in rials per kWh
p_g	Log real gas price in rials per cubic meter
HDD	Log heating degree days
CDD	Log cooling degree days
NI	Log National Income in billion Rials
HC	Log private consumption in billion Rials
C	Constant

In the residential electricity demand presented in Table 1, all the estimated coefficients, including the standard deviation errors and t-statistics, are available.

Table 1
GMM residential electricity demand model estimation results in reference scenario

	First Model			**Second Model**		
Variables	**Coefficients**	**standard deviation errors**	**t-statistics**	**Coefficients**	**standard deviation errors**	**t-statistics**
Constant	0.357408	0.167891	2.128807	-0.1481	0.491192	0.7648
LED(-1)	0.751095	0.045958	16.34300	0.90850	0.034782	0.0000
HC	0.278261	0.055566	5.007715	-	-	-
Lnp_g	-0.023411	0.012540	-1.866848	0.03612	0.033106	1.0911
Lnp_e	-0.104121	0.034772	-2.994434	-0.0332	0.026018	-1.276
LHDD	0.193807	0.031143	6.223067	0.16862	0.079458	2.1221
LCDD	0.160452	0.031106	5.158303	0.12874	0.081002	1.5893
NI	-	-	-	0.04537	0.013079	3.4690
Dummy	0.112858	0.018634	6.056562	0.10349	0.042980	2.4078
Sargan-statistic	0.014060 prob=(0.0021)			0.012851 prob=(0.0030)		
R-squared	0.998922			0.998955		
R^2-adjusted	0.998670			0.998733		
DW	2.154637			2.126898		

Conclusions

Firstly, The estimation results of this model indicate that price elasticity of demand in residential sector is low. However, elasticity of residential electricity consumption to price changes in the period between 1967 up to 2008 is weak and it is because energy prices was subsidized during that time. This fact suggests that there is considerable capacity for price increases necessary to finance generation and distribution system. Secondly, a priori, we expect increases in the income variables to have positive impacts on electricity demand; however, we find that income elasticity of electricity demand is less than unity reflecting saturation effects given that household appliance use and lighting are necessities and unlikely to be much affected by rising income.
Finally, our forecast shows that electricity demand may grow at either 5.37%, 5.75%, or 6.62% per year depending on rates of economic growth scenarios.

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