

Effect of Energy Carriers Prices on Welfare Measurement Indexes

Ghodratallah Ememverdi^a, Mehdi Farahani^{b*}, Ali Mahdiluy Tazekandi^c, Reza Haftlang^d

^a Department of Economic, Central Tehran Branch, Islamic Azad University, Tehran, Iran

^b Department of Management and Accounting, Karaj Branch, Islamic Azad University, Karaj, Iran

^c Department of Commercial Management, Shahid Beheshti University, Tehran, Iran

^d Department of Economic, Tehran University, Tehran, Iran

ABSTRACT

This research present a survey study about the effect of energy carriers price increasing in the consumers welfare costs in Iran by using CV and EV indexes of welfare cost measurement and ALDS demine functions. Applied dale includes energy carriers price including benzene, kerosene, gas oil, fuel oil, liquefied gas and their extends during from 1984 to 2008, model shows that increasing in prices or realizing prices according to governments offer results in 16.5% of decrease in utility level of consumers in society and sum of 510,000 Rials should be paid to compensate income of society consumers and to achieve the initial utility level.

KEY WORDS: energy carriers, welfare measurement indexes (CV, EV), ALDE demand function.

I. INTRODUCTION

Energy is one of the most important problems in economy, politics and society. Iran has rich sources of energy. Appropriate economical management of exhaustible energies is so important. Energy sector in Iran has many problems. Irregular increasing in consume, decreasing in export share, lack of replacement in fuels are some of most important problems in energy sector. so, optimum pricing of energies is one of the important problems in sources management of energy because with present process of consume, expanded import of energy carries is needed for providing the country needs in future that it is as the result of inefficiency of management policies. Per capital consume in the country in 1973 has been more than 14/783 barrels equal to energy per capital and finally, according to the research subject and designed conditions of the allocation pattern of consume in energy carriers sector and the firm decision of the countries executive politician in order to realize energy carriers price, it is necessary to answer practically how much increase in energy carriers price make the welfare cost for consumers. An answer to this question can present the adequate evaluation of the outcomes from executing this policy to the of the country public sector.

The General purpose of this research is to evaluate the welfare cost resulted from increase in energy carriers prices to be able to present an adequate politic pattern for realizing the energy carrier's price. This is a theoretical and applied study .In this research, in order to study the welfare cost first it is necessary to estimate the demand functions of energy carries and then to calculate the compensating variation(CV). In this research, AIDS to demand system and CV index related to this system for evaluating the welfare variations resulted from the variations of energy carriers in Iran are used. The feature of AIDS demand system is that neoclassical hypothesis of demand functions. Relations equations, budget obligations and equality can be exerted. In addition this research want to evaluate the welfare price resulted from the increase in energy carries prices in order to be able to present on adequate political for realizing energy carriers price.

II. LITERATURE REVIEW

Welfare refers to a broad discourse which may hold certain implications regarding the provision of a minimal level of wellbeing and social support for all citizens without the stigma of charity. This is termed "social solidarity". In most developed countries, welfare is largely provided by the government, in addition to charities, informal social groups, religious groups, and inter-governmental organizations. In the end, this term replaces "charity" as it was known for thousands of years, being the act of providing for those who temporarily or permanently could not provide for themselves.

There is a large literature concerned with measuring the welfare effects of price, and therefore also indirect tax, changes. Issues included the precise choice of welfare measure and the use of parametric or non-parametric approaches; for a survey of alternative measures see Becht [1]. Blundell [2] discussed the role of demand systems in

*Corresponding Author: Mehdi Farahani, Department of Management and Accounting, Karaj Branch, Islamic Azad University, Karaj, Iran.
Email: Mehdifara8747@yahoo.com, phone:+982184840001, Fax: +98212184840001

measuring welfare, and Deaton and Ng (1996) have compared parametric and non-parametric approaches.

Khosravi [3] has studied the money equivalent of subsidy in order to prevent the welfare decrease of the families using the adequate index of life cost on the basis of the compensating variations in a research as "evaluating the effects of welfare of the basic goods (bread, sugar and oil) elimination (decrease) in the income quintuplet classes of Iran's urban families." the research results show that the effects of welfare decrease for the discussed goods in the income quintuplet classes are different and according to the results, it is suggested to consider oil as the first goods, then sugar and at last bread in order to eliminate subsidy decrease.

Kenrand and sheroders [4] have done a research as "the durable and brittle goods demand, environmental as" the durable and brittle goods demand, environmental policies and consumers welfare" in Germany. Their purpose is to obtain brittle goods demand system as a function of the brittle goods price, the stock of durable goods and variant costs. They consider 3 family groups with low, medium and high incomes to study the tax welfare effect on benzene. The increase of the tax welfare effects on benzene. The increase of tax pay on benzene is shown in their substitutable costs for each group of the families. They define welfare variation as a movement from a base case with p_0 prices and e_0 costs to a case with tax on benzene with p_1 prices and e_1 transferable costs.

They calculate EV by imposing a 50% rate of tax on benzene and conclude that poor's families (group one) are willing to pay 105 mark in order not to have this tax increase. Though this amount is respectively 581 marks and 815 marks for the second and third groups, that is welfare decreases for all the families but the welfare of high-income group families decrease more than the welfare of low-income group families.

III. MATERIAL AND METHODS

In economy literature, CS, PV, EV, CV, LV standards are used to calculate the consumer's welfare variations which among these standards two standards CV and EV are preferred because they can evaluate considered policy according to the ray optimum and consider that the consumer's behavioral variations against the price variations are theoretically preferred to the rest.

EV income equivalent variation is as a maximum amount that a consumer pays in order to prevent the price decrease in other words, equivalent variation measures the loss which is imposed on a consumer because of the price increase according to the income which they pay in order to prevent this action. EV standard can be explained according to the function of costs as follows:

$$EV = e(u^1, p^1) - e(u^1, p^0) \quad (1)$$

Though this is not the only way of the consumer's loss measurement, there is another standard for measuring the consumer's loss resulted from the price variation which asks how much income should be given to a consumer to compensate their desirability after imposing the price increase to the previous level. In other words, how much income a consumer needs with the new prices in order to achieve a satisfaction level equal to the level before imposing the price variation. CV standard can be explained according to the function of the costs:

$$CV = e(u^0, p^1) - e(u^0, p^0) \quad (2)$$

In this research, we are willing to extract the welfare indexes from the ADIS demand system. In order to achieve this purpose, the ADIS demand system is presented and the preference of this method for estimating a model compared with other methods and then the index of the compensating variations related to it is extracted.

Almost ideal demand system (ADIS) is presented by Deaton and Muellbauer [5] and then is used in England for the analysis of the consuming behavior, this pattern has a remarkable advantage compared to Rotterdam.

The pattern presented by Muellbauer and Deaton [5] is known as static ADIS pattern and then, some moderating has been done which is called as a dynamic ADIS pattern.

This system is not independently extracted by the cost function. These functions show the least necessary costs in order to achieve a particular desirability level in conditions of the existence of specified prices presented as follows:

$$\log c(p, u) = \alpha_0 + \sum_i \alpha_i \log p_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \log p_i \log p_j + u B_0 \prod_{i=1}^n p_i^{B^i} \quad (3)$$

The first derivative of the cost function is the function of the compensating demand function, that is:

$$Q_i = \frac{\delta c(u, p_i)}{\delta p_i} \quad (4)$$

If we multiply the above equation by $\frac{p_i}{c(u, p_i)}$, we will originally get the cost tension.

$$\frac{\delta c(u, p_i)}{\delta p_i} \cdot \frac{p_i}{c(u, p_i)} = \frac{p_i Q_i}{c(u, p_i)} = W_i \quad (5)$$

On the other hand, we know:

$$W_i = \frac{\delta \log c(p_i, u)}{\delta \log p_i} \quad (6)$$

If the cost function relative to $\log p_i$ is derived. The compensating demand function is obtained as the budget

share:

$$\frac{\delta \log c(p_i, u)}{\delta \log p_i} = w_i = \alpha_i + \sum_j \gamma_{ij} \log p_i + B_i u B_0 \prod_{i=1}^n p_i B^i \quad (7)$$

In which

$$y_{ij} = \frac{(\alpha_{ij} \gamma_{ji})}{2} \quad (8)$$

$$\log c(p, u) = \alpha_0 + \sum_i \alpha_i \log p_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \log p_i \log p_j + u \beta_0 \prod_{i=1}^n p_i^{\beta_i}$$

$$u = \frac{\log m - (\alpha_0 + \sum_i \alpha_i \log p_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \log p_i \log p_j)}{\beta_0 \prod_{i=1}^n p_i^{\beta_i}} \quad (9)$$

In can be written on the basis of (1) and (2)

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_i + \beta_i \left[\frac{\log m - (\alpha_0 + \sum_i \alpha_i \log p_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \log p_i \log p_j)}{\beta_0 \prod_{i=1}^n p_i^{\beta_i}} \right] \quad (10)$$

According to the above discussion in this research, CV standard has been used to measure the negative effects resulted from the price increase of the energy carriers on the society .in order to achieve this goal, the ADIS linear demand function has been used to be able to calculate CV .the equation changes ADIS demand system (3) to a system of non-linear and it is rarely used in experimental equations.

Buse [6] presented a pattern in experimental equations which is mainly used as approximate ADIS which is called LA/ADS.

The pattern linearizing of ADIS by substituting the price indexes instead of the linear price index (p) result in forming ADIS or LA/ADS linear pattern.

In this research acetone index is used to linearise which its formula is a follow:

$$\log p = \sum_i w_{it} \log p_i \quad (11)$$

In this equation fit the price of I goods, wit is I goods budget share in t time and P_{i0} and W_{i0} are respectively I price and goods budget share in the basic year.

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_i + \beta_i \left[\frac{\log m - (\alpha_0 + \sum_i \alpha_i \log p_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \log p_i \log p_j)}{\beta_0 \prod_{i=1}^n p_i^{\beta_i}} \right]$$

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_i + \beta_i \log \left(\frac{x}{p} \right)$$

$$\log p = \alpha_0 + \sum_k \alpha_k \log p_k + \frac{1}{2} \sum_i \sum_k \gamma_{ki} \log p_k \log p_j \quad (12)$$

CV standard can be explained according to the function of the prices as follow:

$$CV = e(u_0 p_1) - e(u_0 - p_0) \quad (13)$$

According to the above equation, if the consumer's costs function is available, CV can be extracted. To do this function of ADIS demand system costs whose function from is as follow is used:

$$Lne(u, p) = \alpha_0 + \sum_{i=1}^n \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n \gamma_{ij} \ln p_i \ln p_j + u \beta_0 \prod_{i=1}^n p_i^{\beta_i} \quad (14)$$

According to CV definition and using ADIS costs functions, it can be proved that CV is measured as fallow:

$$CV = \exp \left[A_1 + \prod_{i=1}^n \left(\frac{p_i^1}{p_i^0} \right)^{\beta_i} \cdot (Lne(u^0, p^0) - A_0) \right] - e(u^0, p^0) \quad (15)$$

Which we have:

$$A0 = \alpha_0 + \sum_{i=1}^n \alpha_i \ln p_i^0 + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n \gamma_{ij} \ln p_i^0 \ln p_j^0 \quad (16)$$

$$A1 = \alpha_0 + \sum_{i=1}^n \alpha_i \ln p_i^1 + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n \gamma_{ij} \ln p_i^1 \ln p_j^1 \quad (17)$$

IV. RESULT AND DISCUSION

In order to estimate ADIS model ,the data related to energy consuming costs and the related price indexes have used in 1984-2008 .the primary collected data include six main groups of energies in the country consuming pattern which consists of 1)gas oil .2)fuel oil 3)benzene 4)kerosene 5)liquefied gas 6)other products.

First, it is necessary to study the static or non-static variations of the time series before estimating ADIS model. Using the methods of the time series before estimating ADIS model, using the methods of the usual econometrica in experimental words is on the basis of the static hypotheses of the time series variations in the model .on the other hand, most of the economic time series are non-static. Because of this, it is essential to be sure of its static or non-static before using these time series variations. Augmented Dickey-Fuller (ADF) (1979), Phillips-Perron (PP) (1988) (ADF) (1988) and KPSS (1992) tests have been used in order to achieve to the static or non-static of the used time series variations in the model.

The estimating results of the tests show that most of the model variations by all the 3 standards of the studying single root (KPSS, ADF, and PP) are and the results of subtracting the mentioned variations also indicate the lack of the single root in subtracting the first rank of the data so there is the probability of the false regression existence unless there is cointegration between variations on this base, cointegration should be studied.

In this research, the statistics quantities of trace and max are used in order to assign the number of cointegration vectors. The obtained results confirm the existence of maximum 3 vectors of the cointegration. So the pattern variations are reliable.

Now a model in which the demand classic hypotheses are observed and which lacks the problems of the rejection of the econometrica hypotheses should be estimated .in other words, the hypotheses of the following table should be confirmed in this equation.

TABLE I
CONSTRAINS OF ADIS

Constrains of ADIS	Name
$\sum B_i = 1, \sum_j y_{ij} = 0, \sum \alpha_i = 1$	Collective
$\sum_j y_{ij} = 0$	Homogeneous
$y_{ij} = y_{ji}$	Symmetry estasteski

The first and second rank are obtained by imposing the symmetry condition, equality condition and by solving cointegrating itself by the use of autoregressive processes and the additive condition is also imposed on the model and there is no need to a test consequently, the specification of the energy sector lack the problem of classical hypotheses rejection.

Estimation of the welfare cost resulted from moderating energy prices in Iran's economy, the government spends billion dollars every year to keep or increase the level of the consumers welfare, but if the government decide to eliminate the subsidy it is clear that the increase in prices decreases' the consumers desirability an consequently it decreases their welfare. Now, the government tends to compensate the negative effects resulted from the inflation on the consumers. It needs a standard which measures the intensity of the consumer's impressibility.

CV standard on the basis of ADIS non differential demand function in order to achieve this goal in order to measure the negative welfare effects resulted from the increase of the inflation rate on consumers and according to the estimations resulted from the demand system for the five main energy groups in 1984-2008,these indexes are calculated.

The price index of the energy group instead of p0 and p1 and the estimated results of LAIDS pattern instead of Bi s are used to calculate CV.

TABLE II
THE VARIATION INCOME INDEX

Row	Bi	The variation income index
1	Bi=c(111)=0.07	The benzene income index
2	Bi=c(222)=0.005	The benzene income index
3	Bi=c(333)=0.08	The Gas oil income index
4	Bi=c(444)=0.004	The Fuel oil income index
5	Bi=c9555)=0.02	The kerosene income index

TABLE III
THE VARIATION INCOME INDEX

The CV The total expenditure (percent)	CV (Thousand)	F	Total Cost (Million USD)	Year
1.96	2196.082	964.25	1120.45	1984
2.97	9489.6549	8085.66	3195.17	1985
0.64	3155.2192	5333.15	930.03	1986
1.8	10715.436	3805.11	5953.02	1987
3.6	2611.304	8590.94	7253.14	1988
7.02	57878.777	7832.27	8244.84	1989
3.23	28550.099	9502.24	8839.04	1990
2.5	27685.2	6063.15	11,074.08	1991
2.02	28364.032	13,916.56	14041.6	1992
1.91	28888.559	14330.7	15124.6	1993
2.35	42342.3	14,701.84	18018	1994
6.64	139,406.8	13,817.46	21580	1995
11.5	450386	66,980.27	39164	1996
2.4	131916	52,491.78	54965	1997
7.61	537,684.55	60,341.72	70655	1998
7.19	707,366.58	86,580.14	98382	1999
6.7	916,312.1	190,494.63	136763	2000
3.57	574,666.47	155,394.59	160791	2001
8.89	1,603,162.1	205,861.67	180,333.2	2002
8.93	2,030,592.7	200,638.62	227390	2003
9.74	3,122,141.4	345,145.9	320,548.4	2004
12.99	5,428,167.7	433,341.69	417,812.8	2005
13.36	6,252,474.7	424,242.58	467,999.6	2006
9.43	4,062,657.2	427,382.16	43082.2.6	2007

According to the previous table information and the index of prices and calculated equation related to CV, the welfare costs resulted from the price increase of energy carriers in 1984 to 2008 is calculated. AS it can be seen in the next table, many fluctuations are obvious in the process of CV index and depending on the functions of the energy carriers; price in different years, this index has been also affected. In energy carriers price period has been estimated .it can be concluded that 4.5% of the welfare cost in the sector of the welfare cost is formed because of the increase of the energy carriers in the discussed period.

TABLE IV
 $\Delta\%p$ FOR ENERGY CARRIERS

Energy carriers	Current price	liberalization of prices	$\Delta\%p$
Benzene	1000	4000	300.0
Kerosene	165	1800	990.9
gasoline	165	1800	990.9
Fuel oil	95	1000	952.6
Natural gas	120.1	1000	732.6

TABLE V
TOTAL EXPENDITURE

CV	Total expenditure Compared to CV	year
1267034	4/5	average of 1355-1387

Now the question is how much the simultaneous moderating of the energy carrier's results in the society welfare decrease. To answer this question the following table of the price scenario which shows the amount of the increase in the energy carriers is considered as the current study.

Now the question is with the simultaneous moderating of the prices according to this scenario, how much consumers should be paid in order to achieve to a desirability level be for the price increase.

The results of this study which is mentioned in the next table show that realizing the prices according to the price scenario results in 16.5% decrease in consumer's welfare in the society. In other word, the equivalent income is 51 thousand tomans in order to keep the consumers desirability level of the society.

V.CONCLUSION

Looking at the index process shows being ascendant of the price process in Iran's energy carriers sector .many fluctuations are obvious in CV index process in the discussed period and depending on the fluctuations of the energy carriers price in different years, this index has been affected .on the average 4.5% of the consumption cost in the increase in the energy carriers price.

As these results show, the instantaneous increase of the energy carriers results in a meaningful decrease in the society level and 51 thousand tomans should be paid for comp sating the peoples income of the society in order to achieve the primary welfare level and it results in 16.5% consumers welfare .it is more rational that increasing prices is done step by step in order to decrease the welfare cost.

Undoubtedly, the allocated pattern and the distributing subsidies (particularly in energy carriers sector) should change because of the unfair profit of the villages. But policy of the distributed pattern change is especially important .so important points are mentioned in

1) Sectors in which produced goods have a consuming and medium feature should be separated and in the first step, the pricing pattern of the sectors which the energy carriers are consuming goods should be change.

2)"clustering based on income" should be considered instead of" clustering based on per capital consumption "by separating the consumption of the energy carriers in household. After "clustering based on consumption in the next step, the price of energy carriers should be realized in high-consumption sector.

3) The study of the result in industrial sectors that about 60.7of the sale of the industrial sector is in the control of the large.

Industrial institutions in Iran which more than 50% of energy is consumed in these industries and most of these industries are governmental and quasi - governmental according to ownership. According to this fact I Iran economy, to prevent the negative effects of price increase on all the economy, it is reasonable to make preference in releasing the price of the energy carriers in the industry sector in the primary years of executing the plan and carriers price in the large industry sector first should be realized and in the middle last years of the program all the industrial sectors should be generalized. First, it prevents closing many small institutions and makes on adequate chance for small and medium institutions to rebuild and producing organization. Second, it prevents much increasing in produced goods price in the industrial sector .third, it prevents eliminating the activity of the private sector from the country industry activities (because most of the private institutions in Iran have low or medium producing scale)

4) The price of energy carriers is preferred in releasing .the governing of this view (based on which the whole carrier's price should change in the first phase of executing the plan but in proportionate slope), comes with high information because of the: information expectations". It is reasonable to be preferred and carriers such benzene.

5)Among this, unfortunately ,the cost, the weakness of governmental organizations and other producing sector are considered into account of subsidy in estimating the volume of subsidies ,for example ,if the total price of electricity in Iran is considered 832 rails, more than 205 of this price should be considered as the efficiency in production and utilization and the distribution of the electricity industry .so if the executing of subsidy target is seen in this view, earring income from the plan is not sensible so inefficiency cost should be eliminated from subsidy costs.

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