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Recreational values of forest park using the contingent valuation method (case study: Saravan Forest Park, north of Iran)

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ABSTRACT: The aim of this research was to evaluate the economic values of Saravan Forest Park, north of Iran. The contingent valuation method was used for this propose. In order to do this research, 480 questionnaires were used. The questionnaires were distributed randomly among the visitors in different seasons. A linear logit regression model was used to estimate the relation between dependent and independent variables. The software including MS Excel, Eviews and Shazam was used for statistical analysis of variables, mathematical calculation and parameter estimation of the logit model. Results indicated that the variables such as proposed entrance fee, monthly income, non-governmental organization membership, moralizing view on the environment and natural resources as well as length of stay have significant effects on willingness to pay for the recreational use of the study area. Results showed that 91.19% of people were willing to pay for the recreational value of the forest park. Results also showed that the total annual recreational value of the forest park is 22,761.6 million IRR.

Keywords: willingness to pay; environmental economics; logit regression model; economic values

Ecosystem services are defined as services provided by the natural environment that benefit people. Some of these ecosystem services are well known including food, fibre and fuel provision and the cultural services that provide benefits to people through recreation and cultural appreciation of nature. Other services provided by ecosystems are not known so well. These include the regulation of the climate, purification of air and water, flood protection, soil formation and nutrient cycling (DEFRA 2007). The contingent valuation method (CVM) is used to estimate economic values for all kinds of ecosystem and environmental services. It can be used to estimate both use and non-use values, and it is the most widely used method for estimating non-use values. It is also the most controversial of the non-market valuation methods.

The contingent valuation method involves directly asking people, in a survey, how much they would be willing to pay for specific environmental services. In some cases, people are asked for the amount of compensation they would be willing to accept to give up specific environmental services. It is called "contingent" valuation, because people are asked to state their willingness to pay, contingent on a specific hypothetical scenario and description of the environmental service. The contingent valuation method is referred to as a "stated preference" method, because it asks people to directly state their values, rather than inferring values from actual choices, as the "revealed preference" methods do. The fact that CVM is based on what people say they would do, as opposed to what people are observed to do, is the source of its greatest strengths and its greatest weaknesses (Ecosystem Valuation 2015). The contingent valuation method asks people to directly state their values, rather than inferring values from actual choices, as the

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"revealed preference" methods do. It circumvents the absence of markets for environmental goods by presenting consumers with hypothetical markets in which they have the opportunity to pay for the good in question. The hypothetical market may be modelled after either a private goods market or a political market (Ecosystem Valuation 2015).

There are some other methods to evaluate the recreational value and ecosystem services such as travel cost method (TCM) and hedonic pricing method (HPM). Contingent valuation is an inherently more flexible tool than the other techniques such as HPM and the household production function approach. This is because it is possible in principle to use CVM to examine environmental goods and terms for providing them that are different from what has been observed now or in the past. It is also possible in principle to create CVM scenario experiments that avoid many of the economic modelling problems that are common to most observational data. Contingent valuation is also the only approach that can generally be used to include what is usually referred to as the existence or passive use component of the economic value of an environmental good (Carson, Hanemann 2005).

Contingent valuation method surveys differ from other surveys on public policy issues in several important ways. First, the entire survey is devoted to describing the public good (or a small number of public goods) of interest. Second, they differ in that their major purpose is to obtain an estimate of the relevant Hicksian consumer surplus measure, maximum willingness to pay to obtain a desired good not currently possessed, or minimum willingness to accept compensation to voluntarily give up a good currently possessed. Contingent valuation surveys were first proposed in theory by Ciriacy-Wantrup (1947) as a method for eliciting market valuation of a non-market good. Empirical implementation of CVM initiated by Davis (1963), in his dissertation, sparked considerable interest in the technique. He later compared a CVM estimate with a corresponding estimate based on the TCM (an indirect approach then also being newly developed) and found that the two approaches produced similar estimates.

Contingent valuation method surveys were initially seen as having three distinct advantages. First, CVM can obtain useful information where data on past consumer behaviour had not been collected. Second, CVM permits the creation and presentation of scenarios that provide new goods or changes in existing goods that were substantially outside the range of current consumer experience. Third, CVM allows the measurement of the desired Hicksian consumer surplus rather than its Marshallian approximation. For many economists, the major drawback to CVM-based estimates was that they were based upon stated preferences rather than on observed behaviour.

There are many researches concerning the valuation of recreational sites (forest park, national park, beach, etc.) using CVM such as Hanemann (1984, 1989, 1994), Gunawardena et al. (1996), Hadker et al. (1997), Lee (1997), Lee and Han (2002), Lee and James (2007), Amiri et al. (2015), Lo and Jim (2015).

The purpose of this study is to examine and estimate the recreational benefit of Saravan Forest Park, north of Iran using CVM.

MATERIAL AND METHODS

Study area. Saravan Forest Park includes part of the mountain forests of the Caspian Sea, north of Iran. The area of the park is about 1,487 ha and 1,332 ha or 89.57% of this park is covered by forest. This park is located about 17 km from Rasht, the centre of Guilan province and 300 km from the capital of Iran, Tehran (Fig. 1). It takes about 4 hours to reach the park by car from Tehran. It is one of the most visited tourist destinations in Rasht Township. The number of inhabitants in Rasht is 639,951 (Statistical Centre of Iran 2011).

Facilities such as children playground, parking lot, restaurants, bike paths, hiking trails, rest area and alcove are located in Saravan Forest Park. The forest structure of this park is uneven-aged and major species are oak (*Quercus castaneifolia* C.A. Meyer), hornbeam (*Carpinus betulus* Linnaeus), alder (*Alnus* sp.), ash (*Fraxinus excelsior* Linnaeus), maple (*Acer velutinum* Boissier), and Persian ironwood (*Parrotia persica* (de Candolle) C.A. Meyer). The exotic species loblolly pine (*Pinus taeda* Linnaeus) is also planted at a vast area in this park. Hence, this planted forest has the even-aged structure.

Contingent valuation method. The goal of CVM is to measure the compensating or equivalent variation for the good in question. Compensating variation is the appropriate measure when the person must purchase the good, such as an improvement in environmental quality. Equivalent variation is appropriate if the person faces a potential loss of the good, as he would if a proposed policy resulted in the deterioration of environmental quality. Both compensating and equivalent variation can be elicited by asking a person to report a willingness to pay an amount. For instance, the person may be asked to report his willingness to pay to obtain the

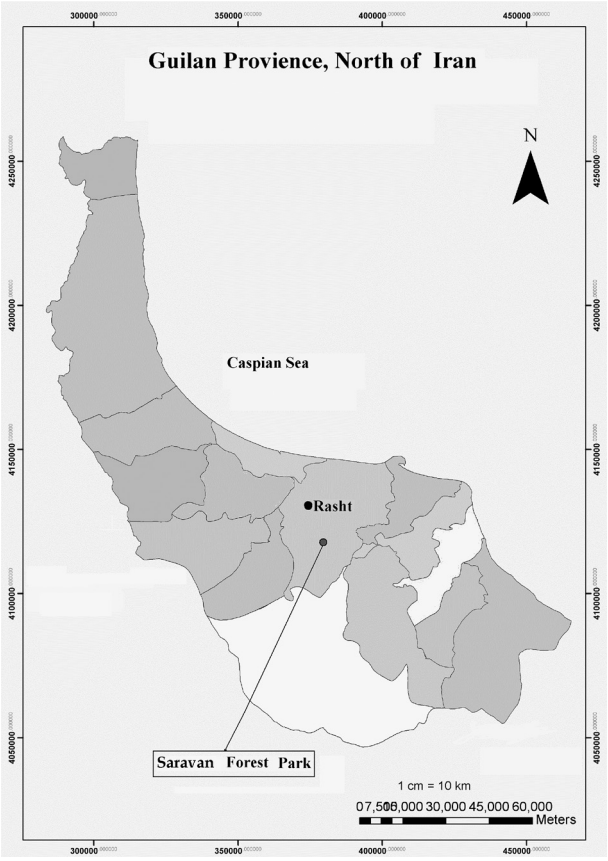

Fig. 1. The study area, Saravan Forest Park, north of Iran

good, or to avoid the loss of the good. Formally, willingness to pay (WTP) is defined as the amount that must be taken away from the person's income while keeping his utility constant (Eq. 1):

$$V(y - \text{WTP}, p, q_0; Z) = V(y, p, q_1; Z) \quad (1)$$

where:

V – indirect utility function,
y – income,
p – vector of prices faced by the individual,
q_0, q_1 – alternative levels of the good or quality indexes ($q_1 > q_0$, indicating that q_1 refers to improved environmental quality),
Z – socio-economic values dependent on individual preference.

Willingness to accept (WTA) for a good is defined as the amount of money that must be given to an individual experiencing deterioration in environmental quality to keep his utility constant (Eq. 2):

$$V(y + \text{WTA}, p, q_0; Z) = V(y, p, q_1; Z) \quad (2)$$

where:

V – indirect utility function,
y – income,
p – vector of prices faced by the individual,
q_0, q_1 – alternative levels of the good or quality indexes ($q_1 > q_0$, indicating that q_1 refers to improved environmental quality),
Z – socio-economic values dependent on individual preference.

In Eqs 1 and 2, utility is allowed to depend on a vector of individual characteristics influencing the trade-off that the individual is prepared to make between income and environmental quality. An important consequence of Eqs 1 and 2 is that willingness to pay or willingness to accept should, therefore, depend on: (*i*) the initial and final level of the good in question (q_0, q_1), (*ii*) respondent's income, (*iii*) all prices faced by the respondent, including those of substitute goods or activities, (*iv*) other respondent's characteristics. Internal validity of the willingness to pay responses can be checked by regressing willingness to pay on variables (*i*)–(*iv*), and showing that willingness to pay correlates in predictable ways with socio-economic variables (FAO 2000).

Sampling method. The sample size (number of questionnaires) is an important issue for proper and reliable estimation of the economic value of the recreational site. The sample was selected using a random method. In order to determine the sample size, 30 preliminary questionnaires were used. Then the variances of questions were determined. The Cochran function was used to determine the required questionnaires (Eq. 3; Cochran 1977):

$$n = \frac{Nt^2s^2}{Nd^2+t^2s^2} \quad (3)$$

where:

n – number of questionnaires (sample size),
N – population size (number of people who visit the recreational area),
t – coefficient of confidence interval that is determined from a *t*-test and it is assumed that the studied attribute is normally distributed,
s^2 – estimated variance of responses to the questions in preliminary questionnaires,
d – degree of accuracy or error percentage, it usually ranges from 1 to 10%.

Sample size estimation is usually done at two stages. At the first stage, it is assumed that it is possible to ignore the fraction size of n/N. Then, the following Equation is extracted from Eq. 3, as Eq. 4:

$$n = \frac{t^2s^2}{d^2} \quad (4)$$

n – number of questionnaires (sample size),
t – coefficient of confidence interval that is determined from a *t*-test and it is assumed that the studied attribute is normally distributed,
s^2 – estimated variance of responses to the questions in preliminary questionnaires,

d – degree of accuracy or error percentage, it usually ranges from 1 to 10%.

Replacing the values of t, s, and d in Eq. 4, the required sample was determined and it was 480 questionnaires as follows (Eq. 5):

$$n = \frac{(1.96)^2(0.559)^2}{(0.05)^2} = 480 \quad (5)$$

where:

n – number of questionnaires (sample size).

The questionnaires were distributed randomly between the visitors in different seasons (autumn and winter in 2014, spring and summer in 2015).

Recreational values questionnaires. Recreational values questionnaire contains three sections. The first part involves the socio-economic situation of visitors to the recreational site with questions such as age, sex, marital status, indigenous status, occupation, educational level, household size, environmental organization membership, length of stay, quality of facilities, and income level. These questions are used in order to evaluate the relationship between effective factors on willingness to pay. The second part of the questionnaire includes the questions such as willingness to pay for the recreational use of the forest park. The third part is about the level of understanding and accuracy of respondents' answers. If the honesty and perception strength of respondents are doubtful, the response is not considered for subsequent analysis.

In part of willingness to pay, proposed fees of the forest park entrance were suggested in order to measure the recreational value. Three fees were proposed for recreational values amounting to 25,000 IRR (lower suggestion), 50,000 IRR (middle suggestion), and 100,000 IRR (higher suggestion). One USD is almost equal to 31,000 IRR in the exchange rate of Central Bank of Iran (Central Bank of Iran 2016). Three proposed fees in each questionnaire have been selected, based on the pre-test and using the open questionnaire. The pre-test was performed for the recreational values of the forest park. Therefore, visitors were asked to declare up a maximum intended amount of willingness to pay for the recreational value in the study area. This means that according to the entrance fee for vehicles and also recalling the existing maintenance costs (hygiene upkeep) and creating new ones (to make alcove and water-cooling machine in a limited place of park), how much they are willing to pay if they would like to pay extra entrance fees for recreational use of the forest park. So, these values were selected according to the economic expert's opinion from the proposed variety of values. Then the chosen fees were presented in the format of three interdependent questions (continuous) in the original questionnaire in order to determine the visitor's willingness to pay for recreational use of the forest park.

Questions related to the willingness to pay were proposed in such a manner that first of all the middle suggestion was asked from visitors. If their answer was negative (positive), then lower (higher) fees were offered to them. Respondents in this section could give a positive or negative response or could refuse to respond to proposed fees. The reason for every response was also recorded. Furthermore, the opposed suggestion of people was recorded against to pay more money for recreational use of the forest park. In addition of the proposed willingness to pay, respondents were asked about the maximum willingness to pay. These answers could help in the further analysis in order to have a better classification.

Cronbach's alpha method. Cronbach's formula is one of the methods to calculate reliability; it has been proposed that α can be viewed as the expected correlation of two tests that measure the same construct. By using this definition, it is implicitly assumed that the average correlation of a set of items is an accurate estimate of the average correlation of all items that pertain to a certain construct. The method is used to calculate the harmony measurement of tools such as questionnaires or tests which measure different features. In such tools, the answer to each question can adopt different values (Cronbach 1951).

To calculate Cronbach's alpha (r_α), variance of the scores of each questionnaire sub-question and total scores must be calculated firstly (Eq. 6):

$$r_\alpha = \frac{j}{j-1}\left(1 - \frac{\sum s_j^2}{s^2}\right) \quad (6)$$

where:

j – the number of series of questions regarding the questionnaire or test,

s_j^2 – under variance of the j^{th} test,

s^2 – variance of the total test.

The zero coefficients show the lack of reliability and + 1 shows that the reliability is excellent. Cronbach's alpha obtained is equal to 0.61 for the proposed questionnaire. The desirable limit of Cronbach's alpha is more than 6.0 for the validity. It is obvious that if Cronbach's alpha is between 0.5 to 0.8, then the questions of questionnaire will be more homogeneous. Therefore, according to the obtained values, our questionnaire is standard.

Logit model. Logit probability model is obtained for the logistic distribution function and values of the predicted probability will be between zero and one. The logit function is the inverse of the logistic function. When the function's parameter represents probability *P*, the logit function gives the log-odds, or the logarithm of the odds $P/(1 - P)$. Eq. 7 represents the logistic cumulative distribution function – $F(Z)$ (Cramer 2003):

$$F(Z) = \frac{1}{1+\exp^{(-Z_i)}} \quad (7)$$

Z_i – socio-economic variables such as income, proposed fee, etc.

The function for the case study is defined as follows (Eq. 8):

$$F(Z_i) = F_\eta(dU) = \frac{1}{1+\exp^{(-dU)}} = \frac{1}{1+\exp^{\{-(\alpha+\beta A+\gamma Y+\theta S)\}}} \quad (8)$$

where:

$F(Z_i)$ – logistic cumulative distribution function,
$F_\eta(dU)$ – cumulative distribution function, it is different from the standard logistic function including some socio-economic variables in this study,
α – original intercept,
β, γ, θ – estimated coefficients that are expected $0 \geq \beta$, $\gamma > 0$, $\theta > 0$,
A – proposed fee,
Y – income,
S – other socio-economic variables.

Hence, the probability that the i^{th} person accepts one of the proposed fees (A) for recreational values is calculated by the following function (Eq. 9):

$$P_i = \frac{1}{1+\exp^{(-Z_i)}} = \frac{1}{1+\exp^{\{-(\alpha+\beta A+\gamma Y+\theta S)\}}} \quad (9)$$

where:

Z_i – socio-economic variables such as income, proposed fee, etc.,
α – original intercept,
β, γ, θ – estimated coefficients that are expected $0 \geq \beta$, $\gamma > 0$, $\theta > 0$,
Y – income,
S – other socio-economic variables.

The probability that the i^{th} person does not accept the proposed fee for recreational values is calculated as follows (Eq. 10):

$$1 - P_i = \frac{1}{1+\exp^{(Z_i)}} = \frac{1}{1+\exp^{\{\alpha+\beta A+\gamma Y+\theta S\}}} \quad (10)$$

where:

Z_i – socio-economic variables such as income, proposed fee, etc.,
α – original intercept,
β, γ, θ – estimated coefficients that are expected $0 \geq \beta$, $\gamma > 0$, $\theta > 0$,
A – proposed fee,
Y – income,
S – other socio-economic variables.

Therefore, Eq. 11 shows the probability ratio of accepting at least one of the proposed fees for recreational values to rejecting it by the i^{th} person:

$$\frac{P_i}{1-P_i} = \frac{1+\exp^{(Z_i)}}{1+\exp^{(-Z_i)}} = \exp^{(Z_i)} = \exp^{\{\alpha+\beta A+\gamma Y+\theta S\}} \quad (11)$$

where:

Z_i – socio-economic variables such as income, proposed fee, etc.,
α – original intercept,
β, γ, θ – estimated coefficients that are expected $0 \geq \beta$, $\gamma > 0$, $\theta > 0$,
A – proposed fee,
Y – income,
S – other socio-economic variables.

By taking the natural logarithm from Eq. 11 we will get Eq. 12 (Abrishami 2006):

$$L_i = ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \alpha + \beta A + \gamma Y + \theta S \quad (12)$$

where:

L_i – logit function,
Z_i – socio-economic variables such as income, proposed fee, etc.,
α – original intercept,
β, γ, θ – estimated coefficients that are expected $0 \geq \beta$, $\gamma > 0$, $\theta > 0$,
A – proposed fee,
Y – income,
S – other socio-economic variables.

In this paper, the parameter value of the logit model was estimated by the maximum likelihood estimation method, which is the most common estimation technique for the logit model.

Furthermore, willingness to pay is used in order to calculate the average willingness to pay. The expected value of willingness to pay E(WTP) is calculated by means of numerical integrals in the range of zero to maximum proposed fee (A) as follows (Eq. 13):

$$\mathrm{E(WTP)} = \int_0^{\max A} F_\eta(dU)dA =$$

$$= \int_0^{\max A}\left(\frac{1}{1+\exp^{\{-(\alpha^*+\beta A)\}}}\right)dA[\alpha^* = (\alpha + \gamma Y + \theta S)] \quad (13)$$

where:

$F_\eta(dU)$ – cumulative distribution function, it is different from the standard logistic function including some socio-economic variables in this study,
dA – differential distance,
α* – modified intercept which is added to the original intercept (α) by including the socio-economic value (Lee, Han 2002),
β, γ, θ – estimated coefficients that are expected $0 \geq \beta$, $\gamma > 0$, $\theta > 0$,
Y – income,
S – other socio-economic variables.

Table 1. Statistical analysis of respondents' socio-economic situation

Variable	Average	SD	Min	Max
Age of respondents (yr)	34.50	10.25	17	74
Respondents' household size (persons)	2.34	1.47	1	7
Respondents' schooling years	13.78	2.88	1	24
Number of visits to the forest park per year	2.89	6.83	0.3	40
Visitor distance to the forest park (km)	495.5	361.3	2	1,300
Length of stay (h)	7.45	13.22	1	90
Facilities quality of forest park	12.75	3.3	1	16
Respondents' monthly income (IRR)*	9,516,345	3,455,623.3	400,000	60,000,000

*the average household income per month in Iran is almost 20,000,000 IRR (Statistical Centre of Iran 2015)

Logit models may be estimated in linear or logarithmic function forms. In this study, the linear logit model was used because it is easier to calculate the average willingness to pay with linear form. The MS Excel (14.0.4756.1000, 2010), Eviews (7, 2010), and Shazam (10.2, 2011) software were used for the statistical analysis of variables, mathematical calculation and parameter estimation of the logit model.

RESULTS

Socio-economic evaluation of visitors

Statistical analysis of the socio-economic situation of site visitors is shown in Table 1. The parameter values such as average, standard deviation, minimum and maximum of each variable are shown in Table 1.

Frequency percentage of visitors' age

Results indicated that the percentage of visitors' age group distribution is as follows: 123 visitors (26%) at the age class of 17–30 years, 177 visitors (37%) at the age class of 31–40, 130 visitors (27%) at the age class of 41–55, and 50 visitors (10%) at the age class more than 56 years old (Table 2).

Frequency distribution of visitors' job

Results of visitors' job indicated that the number of 20 respondents (6%) was high-ranking employee, 145 respondents (32%) were ordinary employee, 137 respondents (30%) were workers, 95 respondents (23%) were self-employed and 44 respondents (9%) had some other kind of job such as students, drivers, retired and so on (Table 3).

Frequency percentage of visitors' education

The education level of 40 respondents (33.8%) was MSc degree or higher, 203 respondents (29.42%) had bachelor degree, 30 respondents (25.6%) had associate degree, 150 respondents (25.31%) had high school diploma degree and 57 respondents (11.88%) had elementary or secondary school degree (Table 4).

Frequency distribution of the number of visits per year

Most respondents visit the study area 2–3 times per year while the detailed results are shown in Table 5.

Frequency percentage of the length of stay

Results of the frequency percentage of the length of stay are shown in Table 6.

Contingent valuation

The main part of the recreational value questionnaire includes questions related to forest visitors' willingness to pay. Hence, 3 interrelated questions were proposed regarding the willingness to pay. The suggested fees were 25,000, 50,000, and 100,000 IRR.

Table 2. Frequency distribution of the age of visitors to the forest park

Age class (yr)	17–30	31–40	41–55	> 56
Number of respondents	123	177	130	50
Percentage	26	37	27	10

Table 3. Frequency distribution of visitors' job

	Job					Total
	high-ranking employee	ordinary employee	worker	self-employed	other kind	
Number of respondents	20	145	137	95	44	480
Percentage	6	32	30	23	9	100

Table 4. Frequency distribution of the level of visitors' education

	Level of education					Total
	MSc degree or higher	bachelor degree	associate degree	high school diploma	elementary or secondary school	
Number of respondents	40	203	150	57	30	480
Percentage	8.33	42.29	31.25	11.88	6.25	100

First of all, the visitors were asked the middle proposed question (50,000 IRR) in such a way that "Saravan Forest Park has provided an opportunity to sights, to enjoy the nature and recreation as well as other usages. Are you willing to pay 50,000 IRR of your income as the entrance fee (ticket price) for each member of your family?" If the answer was negative, a lower price (25,000 IRR) was offered and in the case of positive answer a higher price (100,000 IRR) was offered to the visitors. Results showed that out of 480 respondents, 257 people rejected the first offer (middle offer) and were reluctant to pay 50,000 IRR for each member of their family as the entrance fee, while 223 people accepted it. The second question was offered to the respondents who rejected the first question in such a way that "are you willing to pay 25,000 IRR of your income as the entrance fee for each member of your family?" Results show that 116 people did not accept the second offer, while 141 people accepted it.

Consequently, the respondents that accepted the first offer (50,000 IRR), they were asked the following question: Are you willing to pay 100,000 IRR as the entrance fee? Results show that 123 people rejected it, while 100 people accepted it (Table 7).

Out of 223 respondents who accepted the 50,000 IRR offer, 12 of them declared their maximum willingness to pay up to 60,000 IRR and 10 of them declared their willingness to pay up to 80,000 IRR. Out of 100 respondents who accepted the 100,000 IRR offer, 9 of them expressed their maximum willingness to pay up to 200,000 IRR and 7 of them expressed their willingness to pay up to 300,000 IRR. Out of 257 respondents who did not accept the 50,000 IRR

Table 5. Frequency distribution of the number of visits per year

	Number of visits per year					Total
	first time	repeated				
		1	2–3	4–6	> 6	
Number of respondents	76	40	157	120	83	480
Percentage	15.83	8.33	32.71	25.83	17.29	100

Table 6. Frequency distribution of the length of stay

	Length of stay (h)				Total
	1–6	6–12	12–24	> 24	
Number of respondents	137	287	41	15	480
Percentage	28.54	59.79	8.54	3.13	100

Table 7. Results of the proposed entrance fees

	Proposed entrance fee (IRR)					
	25,000		50,000		100,000	
	answer					
	accept	reject	accept	reject	accept	reject
Number of respondents	141	116	223	257	100	123
Percentage	54.86	45.14	46.5	53.5	44.85	55.15

Table 8. Maximum willingness to pay

	Maximum willingness to pay (IRR)								
	10,000	15,000	20,000	30,000	40,000	60,000	80,000	100,000	200,000
Number of respondents	45	25	13	15	8	12	10	9	7
Percentage	9.2	2.37	5.34	1.78	0.6	1.19	0.3	1.19	1.78

offer, 8 of them expressed their maximum willingness to pay up to 40,000 IRR and 15 of them expressed their willingness to pay up to 30,000 IRR. The respondents who did not accept the proposed 25,000 IRR offer, 13 of them expressed their maximum willingness to pay up to 20,000 IRR, 25 of them expressed their maximum willingness to pay up to 15,000 IRR and 45 of them expressed their willingness to pay up to 30,000 IRR. Table 8 shows the maximum entrance fees which visitors prefer to pay.

Results of logit model

Results of the logit regression model are shown in Table 9. The results show that the variables such as proposed entrance fee, monthly income, non-governmental organization (NGO) membership, moralizing view on the environment and natural resources as well as duration of visit have a significant effect on willingness to pay.

The variables such as proposed entrance fee, monthly income, NGO membership and moralizing view on the environment and natural resources are significant at the significance level of 0.01%, and the duration of visit variable is significant at the significance level of 0.05%.

The negative sign of the proposed entrance fee shows that according to the scenario of the hypothetical market, if the proposed entrance fee increases, the probability of visitors' acceptance of the proposed entrance fee will be decreased and if the proposed entrance fee decreases, the probability of visitors' acceptance of the proposed entrance fee will be increased. According to the elasticity estimation of willingness to pay, with an increase of 1% in the proposed entrance fee, the acceptance probability of the entrance fee will be reduced by 0.554%. Moreover, due to the marginal effect of this variable, with an increase in the proposed fee by 1,000 IRR, the acceptance probability of the entrance fee will be reduced by 0.0000357 units.

The income estimated coefficient is significant at the significance level of 0.01% with positive sign as it was expected. This shows that as the income of visitors increases, the willingness to pay also increases. According to the elasticity estimation of this variable, with 1% increase in the amount of income, the probability of the entrance fee acceptance will be increased by 0.615%. Due to the marginal effect of this variable, when the

Table 9. Results of the logit regression model

Variable	Estimated coefficient	*t*-Statistic value	Elasticity amount	Marginal effect
Constant coefficient	0.412377	–1.0568	–0.45689	–
Proposed fee	–0.35700E-04	–5.2134***	–0.55477	–0.45724E-04
Monthly income	0.42700E-07	6.2358***	0.615326	0.51254E-05
Age	0.17150E-02	1.1559	0.18427	0.23257E-02
Sex	0.02331	–0.5751	–0.05576	–0.32987E-01
Marital status	0.00152	0.2682	0.22467	–0.82558E-02
Number of family members	–0.65440E-2	–0.31713	–0.04562	–0.71649E-02
Educational level	0.18730E-20	–0.8042	–0.18869	0.45622E-02
Native	0.02548	0.1247	0.01478	–0.73341E-02
Number of visits	–0.01528	–1.3174	–0.04420	0.45341E-02
Length of stay	0.01325	1.3427**	0.08655	0.21875
Moralization of environmental and natural resources	–0.01457	4.3435***	0.2370	0.26582
Membership in environmental protection organizations	0.13257	2.8926***	0.15578	–0.45724E-04

likelihood-ratio test = 123.286, probability of hypothesis rejection = 0.0000, accuracy percentage of forecast = 0.89514, Cragg-Uhler coefficient = 0.19758, McFadden R^2 = 0.31572, **significance level at 5%, ***significance level at 1%

income increases by 1,000 IRR, the probability of the entrance fee acceptance will be increased by 0.00051 units.

The next significant variable at the significance level of 1% is a moralizing view on the situation of the environment and natural resources. The calculated elasticity amount for this variable shows that with an increase of 0.237% in this variable, the probability of the entrance fee acceptance will be increased by 0.237 units. The marginal effect of changes in this variable shows that with an increase of 0.218% in the acceptance probability of the moralizing view on the situation of the environment and natural resources, the probability of the entrance fee acceptance will be increased 0.218 units.

The membership in the organizations of environmental protection and natural resources is a significant variable at the significance level of 5% with positive sign and shows the increase in willingness to pay. Hence, there is a direct relation between the two above-mentioned variables. It shows that with an increase of 1% in the probability of being a member of institutions of environmental protection and natural resources, the willingness to pay will be increased by 0.105%. Due to the marginal effect of this variable, with an increase of 1% in the probability of being a member of such a kind of institution, the acceptance probability of the willingness to pay will be increased by 0.105 units.

According to the results, 91.19% of those surveyed in this study are willing to pay for recreational values of the study area.

The statistics in Table 9 show the explanatory power of the logit model. The likelihood-ratio test compares the probability functions in the bounded state (when all coefficients are zero) and in the unbounded state. The estimated likelihood-ratio test is 123.286 and it is significant at the significance level of 1%. This indicates that in the logit regression model, explanatory variables (independent) could describe a dependent variable (willingness to pay) very well. Therefore, due to the significance of this test, it is not possible to assume that all of the variables should be zero at the same time.

The McFadden determination coefficient in the estimated regression model is 0.31572. This indicates that the explanatory variables of the model properly explain the changes in dependent variables of the model. The percentage of correct predictions in this logit estimated regression model is equal to 89.51% and indicates that the estimated model has been predicted a high percentage of the dependent variable values due to the explanatory variables. In other words, nearly 89.51% of respondents answered "yes" or "no" to the willingness to pay by providing an appropriate ratio of proper information.

The willingness to pay (WTP) value of each person is calculated for the recreational use of Saravan Forest Park. Hence, after estimating the parameter values of the logit model using the maximum likelihood method, by numerical integration from zero to the proposed maximum willingness to pay (100,000 IRR) as Eq. 14:

$$\mathrm{WTP} = \int_0^{100{,}000} \frac{1}{1+\exp-\{0.618795-(0.000357A)\}} dA = 75{,}872 \quad (14)$$

where:

A – proposed fee,

dA – differential distance.

According to Eq. 14, the average willingness to pay for the use of Saravan Forest Park was 75,872 IRR per person per visit.

It is required to have the average of annual visits in order to calculate the annual recreational value of the forest park. According to the obtained data from the forest park reception and the tickets sold based on the number of entered cars to the recreational site, the annual average visit was about 300,000 visitors.

In order to calculate the total economic value of the forest park, the average number of visitors per year should be multiplied by the obtained average willingness to pay (Eq. 15):

Total recreational value of the forest park = average number of visitors per year × average amount of willingness to pay per person = 300,000 visitors × 75,872 IRR per person per visit = 22,761,600,000 IRR (15)

In order to calculate the recreational value per hectare of forest park, the area of forest park should be divided by the total recreational value of the forest park (Eq. 16):

Recreational value per hectare of forest park = area of forest park/total recreational value of the forest park = 22,761,600,000 IRR/1,487 ha = 15,307,061 IRR·ha^{-1} (16)

DISCUSSION

The contingent valuation method is used to estimate the recreational value of Saravan Forest Park in the north of Iran. The demand for outdoor recreation has been increasing with the increasing population density. However, natural and finan-

cial resources for outdoor recreation are limited. Therefore, it is required to estimate the economic benefit of recreational sites for an optimum allocation of scarce resources. Contingent valuation method has been the most commonly applied valuation method in recent years, and it has been developed mainly in environmental valuation. The contingent valuation method is a simple, flexible nonmarket valuation method that is widely used in cost-benefit analysis and environmental impact assessment. However, this method is subjected to severe criticism. The criticism revolves mainly around two aspects, namely, the validity and the reliability of the results, and the effects of various biases and errors (Venkatachalam 2004). The contingent valuation method is one of the scarce ways to assign monetary values to non-use values of the environmental values that do not involve market purchases and may not involve direct participation. These values are sometimes referred to as "passive use" values. They include everything from the basic life support functions associated with ecosystem health or biodiversity, through the enjoyment of a scenic vista or a wilderness experience, to appreciating the option to fish or bird watch in the future, or the right to bequest those options to your grandchildren. It also includes the value the people place on simply knowing that giant pandas or whales exist.

It is clear that people are willing to pay for non-use, or passive use, environmental benefits. However, these benefits are likely to be implicitly treated as zero unless their dollar value is somehow estimated. So, how much are they worth? Since people do not reveal their willingness to pay for them through their purchases or by their behaviour, the only option for estimating their value is by asking them questions.

However, the fact that the contingent valuation method is based on asking people questions, as opposed to observing their actual behaviour, is the source of enormous controversy (Ecosystem Valuation 2015). Based on the above-mentioned strengths and weaknesses, this method is often used to estimate the monetary value of environment. However, if the researcher designs a good questionnaire based on a preliminary questionnaire and tries to omit the bias and unnecessary questions, then this approach will be realistic to measure the nonmarket goods and services of forest areas.

Is an expert judgment an alternative to contingent valuation? Experts clearly play the leading role in determining the physical injuries to the environment and in assessing the costs of clean-up and restoration. Assessing what things are worth is different. How the experts know the value that the public places on an uninjured environment, without resort to measurement involving some sort of survey, is unclear. When that public valuation is the object of measurement, a well-designed contingent valuation survey is one way of consulting the relevant experts and the public itself (Hanemann 1994).

Results of this study indicated that the variables such as proposed entrance fee, monthly income, NGO membership, moralizing view on the environment and natural resources and length of stay have a significant effect on willingness to pay for the study area. Results showed that 91.19% of the visitors were willing to pay for the recreational value of Saravan Forest Park. The annual recreational value was 22,761.6 million IRR at this research. The underlying case for the valuation of ecosystem services is that it will contribute to better decision-making, ensuring that policy appraisals will fully take into account the costs and benefits to the natural environment (DEFRA 2007).

The average willingness to pay for the use of Saravan Forest Park was 75,872 IRR per person per visit, while there are some researches regarding the estimation of recreational sites in Iran. Amirnejad et al. (2014) investigated the recreational value of Sari Forest Park in the north of Iran using CVM. The results show that the average monthly willingness to pay of each forest park visitor was 17,820 IRR. Amirnejad et al. (2006) investigated the recreational value of Sisangan Forest Park that is located in the north of Iran using CVM. Results indicated that the recreational value of the study area was 2,477 IRR per visit.

The contingent valuation method can help decision makers to identify the public's interest. It is particularly useful in two cases. One is where the benefits of providing an environmental good are large but diffuse and their provision is opposed by a powerful special interest group. In this case a countervailing interest group pushing for the provision of the good is unlikely to spring up. The other is when there is a strong lobby in favour of providing an environmental good, with the public as a whole footing the bill and their aggregate willingness to pay for it being much smaller than its cost. The nature of the political process will often be to supply the good to the determinant of the public's welfare as long as there is not a strong group opposing it. In both cases, an estimate of the public's willingness to pay for the good can help illuminate the nature of the decision at hand (Carson, Hanemann 2005).

The results of this study can provide justification for policy makers and decision makers of natural resources to implement policies in order to develop the recreational site.

References

Abrishami H. (2006): Microeconomics. Tehran, University of Tehran: 742.

Amiri N., Emadian S.F., Fallah A., Adeli K., Amirnejad H. (2015): Estimation of conservation value of myrtle (*Myrtus communis*) using a contingent valuation method: A case study in a Dooreh forest area, Lorestan Province, Iran. Forest Ecosystems, 2: 30.

Amirnejad H., Ahmadi Kaliji S., Aminravan M. (2014): The application of the contingent valuation method to estimate the recreational value of Sari Forest Park. International Journal of Agriculture and Crop Sciences, 7: 708–711.

Amirnejad H., Khalilian S., Assaresh M.H., Ahmadian M. (2006): Estimating the existence value of north forests of Iran by using a contingent valuation method. Ecological Economics, 58: 665–675.

Carson R.T., Hanemann W.M. (2005): Contingent valuation. In: Mäler K.G., Vincent J.R. (eds): Handbook of Environmental Economics. Amsterdam, Elsevier: 821–936.

Central Bank of Iran (2016): Foreign exchange rates. Available at http://www.cbi.ir/ExRates/rates_en.aspx (accessed Aug 11, 2016).

Ciriacy-Wantrup S.V. (1947): Capital returns from soil-conservation practices. Journal of Farm Economics, 29: 81–96.

Cochran W.G. (1977): Sampling Techniques. 3rd Ed. New York, John Wiley & Sons, Inc.: 428.

Cramer J.S. (2003): Logit Models from Economics and Other Fields. Cambridge, Cambridge University Press: 13.

Cronbach L.J. (1951): Coefficient alpha and the internal structure of tests. Psychometrika, 16: 297–334.

Davis R.K. (1963): Recreation planning as an economic problem. Natural Resources Journal, 3: 239–249.

DEFRA (2007): An Introductory Guide to Valuing Ecosystem Services. London, Department for Environment, Food and Rural Affairs: 68.

Ecosystem Valuation (2015): Contingent valuation method. Available at http://www.ecosystemvaluation.org/contingent_valuation.htm (accessed Jan 10, 2016).

FAO (2000): Applications of the Contingent Valuation Method in Developing Countries: A Survey. Rome, FAO: 146.

Gunawardena U.A.D.P., Edwards-Jones G., McGregor M.J., Abeygunawardena P. (1996): Tropical forestry a contingent valuation approach for a tropical rainforest: A case study of Sinharaja Rainforest Reserve in Sri Lanka. In: Roper C., Park A. (eds): The Living Forest: Non-market Benefits of Forestry. Proceedings of an International Symposium on Non-market Benefits of Forestry, Edinburgh, June 24–28, 1996: 275–284.

Hadker N., Sharma S., David A., Muraleedharan T.R. (1997): Willingness to pay for Borivli National Park: Evidence from a contingent valuation. Ecological Economics, 21: 105–122.

Hanemann W.M. (1984): Welfare evaluations in contingent valuation experiments with discrete responses. American Journal of Agricultural Economics, 66: 332–341.

Hanemann W.M. (1989): Welfare evaluations in contingent valuation experiments with discrete response data: Reply. American Journal of Agricultural Economics, 71: 1057–1061.

Hanemann W.M. (1994): Valuing the environment through contingent valuation. Journal of Economic Perspectives, 8: 19–43.

Lee C.K. (1997): Valuation of nature-based tourism resources using dichotomous choice contingent valuation method. Tourism Management, 18: 587–591.

Lee C.K., Han S.Y. (2002): Estimating the use and preservation values of National Parks' tourism resources using a contingent valuation method. Tourism Management, 23: 531–540.

Lee C.K., James W.M. (2007): Valuation of ecotourism resources using a contingent valuation method: The case of the Korean DMZ. Ecological Economics, 63: 511–520.

Lo A.Y., Jim C.Y. (2015): Protest response and willingness to pay for culturally significant urban trees: Implications for contingent valuation method. Ecological Economics, 114: 58–66.

Statistical Center of Iran (2011): Implementation of the 2011 Iranian population and housing census in autumn (24 October–13 November 2011). Available at http://www.amar.org.ir/english/Census-2011 (accessed Oct 15, 2015).

Statistical Center of Iran (2015): Iran statistical yearbook 1392 (2013–2014). Available at http://irandataportal.syr.edu/wp-content/uploads/preliminary.pdf (accessed Aug 11, 2016).

Venkatachalam L. (2004): The contingent valuation method: A review. Environmental Impact Assessment Review, 24: 89–124.

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