ESTIMATING CONSUMER SURPLUS USING PARAMETRIC AND SEMIPARAMETRIC TRUNCATED RECREATION DEMAND MODELS: A CONCEPTUAL NOTE

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Consumer surplus is estimated from parametric and semiparametric truncated recreation demand models in a series of Monte Carlo experiments. The experimental designs simulate truncated recreational demand data under different error distributions, sample sizes, and truncation rates. Within each experiment, consumer surplus is estimated using observed and predicted demand. Summary statistics are used to determine the direction and magnitude of the error introduced into consumer surplus due to model misspecification, and to examine the robustness of consumer surplus derived from semiparametric truncated models.

Results of the Monte Carlo experiments suggest that with the exception of a few isolated cases involving the truncated symmetrically trimmed least squares model, consumer surplus from all three parametric and semiparametric truncated recreation demand models examined yield consumer surplus that excessively overestimates the simulated consumer surplus. The magnitude of overestimation by these models often exceed 70%.

Lebihan pengguna di anggar dari model permintaan rekreasi terpangkas berparameter dan semi-berparameter dalam satu seri eksperimen Monte Carlo. Rekabentuk eksperimen ini bercorak simulasi data-data permintaan rekreasi terpangkas, dengan taburan ralat, saiz sample, dan kadar pemangkasan yang

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berbeza. Dalam setiap eksperimen, lebihan pengguna di anggar dengan menggunakan permintaan tercerap dan diramal. Kaedah statistik penyimpulan digunakan untuk menentukan arah dan magnitud ralat yang dihasilkan ke atas lebihan pengguna yang disebabkan oleh spesifikasi model tersilap. Tambahan lagi, keteguhan lebihan pengguna yang dihasilkan melalui model terpangkas semi-berparameter juga dikaji.

Keputusan eksperimen Monte Carlo mencadangkan bahawa selain dari beberapa kes terpencil yang melibatkan model "truncated symmetrically trimmed least squares", lebihan pengguna dari ketiga-tiga model permintaan rekreasi terpangkas berparameter dan semi-berparameter yang dikaji memberi keputusan penganggaran berlebihan. Magnitud penganggaran model-model ini sering melebihi 70%.

On-site sample surveys are commonly used in recreation demand studies. For example, surveyors may conduct on-site surveys or distribute questionnaires to visitors of Gunung Kinabalu, Penang Hill, or Taman Negara in order to ascertain the value of the recreation site to an individual. Other examples include the collection of data via questionnaires distributed at airports, railway stations, or other ports of entry in the country. Such sampling techniques utilize data collected from visitors of recreational sites to estimate the value of the amenity. Given that only participants of the recreational activity or actual visitors to the recreational sites are surveyed, values of the explanatory variables are observed only if the value of the dependent variable is observed. Nonvisitors are thus omitted (truncated) and assumed to place no value on the environmental amenity.

Researchers have compared the use of alternative truncated models Olsen's method (1976) and maximum likelihood estimators) on the estimation of recreation demand functions (Shaw, 1988; Wetzstein and Ziemer, 1983), and on the effects of choice of functional form and sample truncation on welfare measures (Ozuna, Jones and Capps, 1993). However, an issue yet to be examined is the effect of using a misspecified truncated model to compute consumer surplus. This issue is important because misspecified truncated models yield biased and inconsistent parameter estimates (Arabmazar and Schmidt, 1981; Hurd, 1979; Maddala, 1983; Judge *et al.*, 1988). As a result, empirical studies using misspecified truncated models to compute consumer surplus may be biased and inconsistent as well.

An additional issue yet to be investigated is the use of semiparametric truncated models to estimate consumer surplus. These semiparametric truncated models have been proposed in the econometric literature as alternatives to using

misspecified truncated models. Unlike parametric truncated models, semiparametric truncated models are distribution-free, and as such, do not rely on the distribution assumptions of the error term. Does the use of semiparametric truncated models lead to more accurate and reliable measures of consumer surplus? To date, researchers have not address this question in a vigorous manner.

Hence, the specific objectives of this concentual note are two-fold. The first objective is to determine the magnitude and direction of the error (if any) introduced into consumer surplus estimation due to misspecified truncated models. The second objective is to examine the use of semiparametric truncated models for computing consumer surplus. These objectives are accomplished using Monte Carlo simulation experiments.

THE PARAMETRIC TRUNCATED MODEL

The standard truncated model is generally written as

$$
\begin{aligned}
(1) \qquad y &= x_i'\beta + u_i, \qquad i = 1, 2, \ldots, n \\
y_i &= 0 \qquad \text{if } y_i^* \le 0, \\
y_i &= y_i^* \qquad \text{if } y_i^* > 0,
\end{aligned}
$$

where, y_i^* is a latent variable; y_i is the observed dependent variable; x_i is a k-dimensional vector of known regressors; β is a k-dimensional vector of parameters; and u_i, is assumed to be $N(0, \sigma^2)$. Sample observations for which $y_i = 0$ are then discarded from the regression model (i.e., the dependent variable contains observations with positive values only). This characteristic occurs in on-site sample surveys, whereby, only the participants of the activity are surveyed.

Amemiya (1973) has shown that using the truncated maximum likelihood estimation (TMLE) methods, parameter estimates of (1) can be obtained by maximizing the log-likelihood function:

$$
(2) \qquad \ln L = -\sum \ln \Phi_i - (n/2)\ln\sigma^2 - (1/2\sigma^2)\sum (y_i - x_i'\beta)^2,
$$

where, $\sum$ denotes the summation over values of $i = 1 \ldots n$ for all observations where $y_i > 0$; σ is the standard deviation of the assumed error term, u; and $\Phi(\cdot)$ is the cumulative distribution function of the standard normal function

evaluated at $x_i'\beta/\sigma$; n is the number of observations. Amemiya also provides a consistent procedure to correct for the truncation problem using an iterative two-step procedure via some version of Newton's method.

THE SEMIPARAMETRIC TRUNCATED MODELS

Two classes of semiparametric models have been derived for the truncated regression model. The first class is obtained by optimizing criterion functions that do not depend explicitly on the unknown distribution of u. The second class consists of models based on criterion functions that do depend explicitly on the distribution of u. Models in this latter class involve estimating β and the distribution of u simultaneously. In this study, the truncated symmetrically trimmed least squares (TSTLS) model from the first class and the truncated Buckley and James (TB&J) (1979) model from the second class are employed.

The TSTLS model is obtained by minimizing:

$$(3) \qquad R_i(\beta) = \sum (y_i - \max\{0.5y_i, x_i'\beta\})^2$$

where, $\sum$ goes from $i = 1$ to n. As illustrated by Powell (1986), the TSTLS $\hat{\beta}_n$ of β is defined to be any value of β which minimizes $R_i(\beta)$. Heuristically, this model deletes data points for which $u_i \leq -x_i'\beta$ and $u_i \geq x_i'\beta$ from the sample. Observations for which $x_i'\beta \leq 0$ would automatically be deleted from the sample, and thus, the error terms of the remaining observations would lie between $(-x_i'\beta, x_i'\beta)$. Powell further adds that the "symmetrically truncated" sample would then contain residuals that are symmetrically distributed about zero while the corresponding y_i would take on values in the interval of $(0, 2x_i'\beta)$ and be symmetrically distributed about $x_i'\beta$. Symmetry in the error terms is an essential condition for the TSTLS model. At the same time, the corresponding regressors must be sufficiently variable to ensure a unique solution to identify β (Powell).

The TB&J model is also a least-squares model applied to the truncated sample. For this model, the conditional expectations of y_i^* can be written as:

$$(4) \quad E(y_i^* \mid x_i'\beta + u_i > 0) = x_i'\beta + E(u_i \mid u_i > -x_i'\beta)$$
$$= x_i' + \int_{-x_i'\beta}^{\infty} u dF(u)/[1 - F(-x_i'\beta)],$$

where, the integral term on the right-hand-side of (4) is constructed from the Kaplan-Meier (1958) product limit estimates for the distribution of u. The parameter estimates of the TB&J estimator are obtained iteratively by successively applying ordinary least squares after replacing β by its prior estimate $\hat{\beta}_{(1)}$ in the right hand term of equation (4) for the truncated samples, where $\hat{F}(\cdot, \beta)$ denotes the Kaplan-Meier product limit estimate of $F(\cdot)$ when $\beta = \hat{\beta}$ (Buckley and James).

THE COMPUTATION OF CONSUMER SURPLUS

The basic formula for computing consumer surplus (CS)[1] is given by:

$$(5) \quad CS = \int_{P_o}^{P_c} Y^*(P \mid u)\, dP$$

where, $Y^*(P|u)$ denotes the conditional observed demand at price P; P_c refers to the cutoff price at which $Y^*(P|u)$ equals zero; and P_0 is the price that the consumer faces. When the demand function is defined as a simple linear model as in (1) with price coefficient β_P, the formula for computing consumer surplus for individual *i* simplifies to:

$$(6) \quad CS = -\frac{Y_i^2}{2\beta_P}$$

Equation (6) can be used to compute an individual's consumer surplus when the stochastic term in the regression model is attributed to omitted variables. Such circumstance exists when the systematic portion of the demand curve is shifted through the observed price-quantity point (Bockstael and Strand, 1987).

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[1] As pointed out by a reviewer, the Hausman methods would adequately measure welfare measure in terms of compensating variation (CV) just as well as consumer surplus.

However, when the stochastic term is attributed to measurement errors, Bockstael and Strand note that two possible scenarios may occur. The sources of error may be attributed to either the randomly varying individual preferences or problems with exact measurement of the dependent variable. In such cases, the expected value of consumer surplus, E(CS), is the more appropriate measure to be considered. The formula for E(CS) is written as:

$$(7) \qquad E(CS) = \int_E \int_{P_o}^{P_c} (Y^*(P|\, u)dPdF(u)$$

$$= \int_{P_0}^{P_C} \int_E (Y^*(P \mid u)dF(u)dP$$

$$= \int_{P_0}^{P_C} Y(P)dP$$

$$= \int_{P_0}^{P_C} E(Y)dP$$

where, F(u) is the distribution of the error term, u; and E is the range of support of u. The E(Y) is derived as:

(8a)

$$E(Y_i) = \text{prob}(Y_i > 0) \text{ x } E(Y_i \mid Y_i > 0) + \text{prob}(Y_i = 0) \text{ x } E(Y_i \mid Y_i = 0),$$

but since $E(Y_i \mid Y_i = 0) = 0$ and $\text{prob}(Y_i > 0) = 1$ in the truncated regression case, we have

(8b) $\qquad E(Y_i) = E(Y_i \mid Y_i > 0).$

The expected value of Y_i given $Y_i > 0$ can be written as:

$$E(Y_i \mid Y_i > 0) = E(x_i'\beta + u_i \mid Y_i > 0)$$

$$= x_i'\beta + E(u_i \mid Y_i > 0)$$

$$= x_i'\beta + E(u_i \mid x_i'\beta + u_i > 0)$$

$$(9a) \qquad = x_i'\beta + E(u_i \mid u_i > -x_i'\beta).$$

The last term in (9a) can be redefined as:

$$(9b) \qquad \delta \equiv E(u_i \mid u_i > -x_i'\beta) = \frac{1}{[1-F(-x_i'\beta)]} \times \int_{-x_i'\beta}^{\infty} udF(u)$$

where, the integral term in (9b) corresponds to the conditional expectation of Y_i, conditional on these values being greater than zero. Hence, the expected value of the dependent variable over all observations in (8a) and (8b) can be written as:

$$(9c) \qquad E(Y_i) = x_i'\beta + \int_{-x_i'\beta}^{\infty} udF(u)/[1-F(-x_i'\beta)].$$

Without assuming a distribution assumption on u, $F(\cdot)$ in (9c) is estimated using the Kaplan-Meier product limit estimator (see Deaton and Irish, 1984; Moon, 1989; and Oakes, 1993; for a more detailed discussion of the Kaplan-Meier product limit estimator). This procedure is suited for the TSTLS and the TB&J models since the semiparametric estimators are distribution-free and do not rely on the distribution assumptions of the error term. By substituting (9c) into (7), the formula for computing E(CS) of the TSTLS and the TB&J models can be written as:

$$(10) \qquad E(CS) = \int_{P_o}^{P_c} \left[x_i'\beta + \int_{-x_i'\beta}^{\infty} udF(u)/[1-F(-x_i'\beta)] \right] dp.$$

For the TMLE model, its error terms are assumed to be $N(0, \sigma^2)$. As such, substituting (1) into (8b) and by manipulating the conditional expected demand yields:

$$(11) \qquad E(Y_i) = \Phi * E(Y \mid u > -x_i'\beta) + (1-\Phi)*0$$

$$= E(Y \mid u > -x_i'\beta)$$

$$= x_i'\beta + \sigma(\phi/\Phi)$$

since $E(Y|\, u > -x_i'\beta) = x_i'\beta+\sigma(\phi/\Phi)$ from Maddala, and $\Phi = 1$ in the truncated regression case. Hence, by substituting (11) into (7), the formula for computing the E(CS) of the TMLE model is:

$$(12) \qquad E(CS) = \int_{P_o}^{P_c} [x_i' + \sigma(\phi/\Phi)]dP\,,$$

where, ϕ and Φ are evaluated at $(x_i'\beta/\sigma)$; and σ is the standard deviation of the error term.

THE CONSTRUCTION OF THE MONTE CARLO EXPERIMENT

The recreation demand function used in the Monte Carlo simulation experiments is:

$$(13) \qquad Trips_i = \alpha + \beta Price_i + \gamma Income_i + \varepsilon_i.$$

where, $Trips_i$ is the number of trips taken by individual *i*; $Price_i$ and $Income_i$ are the individual's travel cost and income respectively; α, β, and γ are parameters that need to be estimated; and, ε_i is the error term. During each replication, $Price_i$ and $Income_i$ are generated from a uniform distribution ranging from [5, 50] and [5,000, 100,000] respectively. For the base case, the distribution of ε_i is assumed to be normal. To explore the effects of non-normality in consumer surplus estimation, Cauchy and Laplace distributions are adopted. To investigate the effects of asymmetry in consumer surplus estimation, a normal right-skewed and a normal left-skewed distribution are adopted to the distribution of ε_i. A heteroscedastic distribution is also added to examine the effects of heteroscedasticity. The heteroscedastic distribution is generated by multiplying ε_i with an increasing and positive function of the price regressor. The normal and Laplace distributions are generated with mean 0 and variance 10, and the Cauchy distributed with median 0 and scale parameter 1. The asymmetric error distributions are mixtures of normals with overall variance equal to 10. Specifically, the normal right-skewed distribution is:

$$(14a) \qquad \varepsilon_i \sim \begin{cases} N(12,220) & \text{with probability } 0.2, \\ N(-3,25) & \text{with probability } 0.8, \end{cases}$$

and the normal left-skewed distribution is:

$$(14b) \qquad \varepsilon_i \sim \begin{cases} N(-12,220) & \text{with probability } 0.2, \\ N(3,25) & \text{with probability } 0.8, \end{cases}$$

Sample sizes of 125 and 500 are employed in the experiment to denote small and large data sets. While the simulated values of β and γ are set at -0.2 and 0.00005, α is chosen such that the truncation probability is either 25% or 50%. To represent truncation, sample observations of the dependent variable that are zeros are then deleted. In total, there are 48 sample designs. The number of replications for each sample design (combination of error distribution, sample size, and truncation rate) is set to 250. The recreation demand function in (13) and their respective values are similar to those employed in Kling (1992). The distribution assumptions are similar to those found in Honore and Powell (1992), and Moon (1989) except for the case of heteroscedasticity which they did not consider.

To ensure that the integrability conditions necessary for the linear demand functions in (13) to be consistent with the conjecture of utility maximization, the following inequality restrictions: (i) $y_i \leq -(\hat{\beta}/\hat{\gamma})$, and (ii) $0 \leq CS_i \leq Income_i$ are imposed. In doing so, the possibility of $\hat{\beta} = 0$ is ruled out when y_i is nonzero (Kling and Sexton, 1990; Smith, 1988). Kling (1991) notes that these inequality restrictions guarantee the existence of finite first and second moments for the distribution of consumer surplus.

For each of the models examined, mean consumer surplus (MCS), mean error of consumer surplus (ME), mean proportional error consumer surplus (MPE), mean error as a proportion of the simulated consumer surplus (MEC), and root-mean-square-error (RMSE) of consumer surplus are considered. The MCS is the average over the 250 replications of the estimated consumer surplus in the truncation regression model. ME measures the average difference between the simulated consumer surplus and the estimated consumer surplus, MPE is interpreted as the mean proportion of the estimated consumer surplus to the simulated consumer surplus, while MEC is calculated to facilitate comparisons across different simulation designs since the errors are measured in percentage terms. Lastly, the RMSE is used as a measure of the variance of the estimate. Further elaboration on the above diagnostic statistics are provided in Table 1.

Tables 2 through 5 contain results of comparisons between the simulated consumer surplus and the estimated consumer surplus obtained from the parametric and semiparametric truncated models. Tables 2 & 3 focus on results

derived from observed demand while Tables 4 & 5 relate to results derived from predicted demand. Note that the other major difference between the tables lies in the truncation rate[2]. Using the models specified in (1) and (13), the TMLE, semiparametric TSTLS and the semiparametric TB&J models were used to compute consumer surplus estimates which were then compared to the simulated consumer surplus. The simulated consumer surplus is considered to be the "true" consumer surplus measure. The normal distribution is used as the base case for comparison purposes.

MONTE CARLO EXPERIMENT RESULTS[3]

Results from the Monte Carlo experiments suggest that under normal, normal left-skewed, and normal right-skewed error distributions, consumer surplus estimates from the TMLE model using both truncated observed and truncated predicted demands diverge considerably from the simulated consumer surplus at both truncation rates.

Under normality conditions, consumer surplus estimates derived from the TSTLS model using truncated observed demand diverge from the simulated consumer surplus for both truncation rates. When consumer surplus estimates are computed from the TSTLS model using truncated predicted demand, the accuracy of the models is redeemed as convergence to the simulated consumer surplus occurs for 25% truncation rate. At 50% truncation rate, consumer surplus estimates also diverge from the simulated consumer surplus. For normal left-skewness, consumer surplus estimates from the TSTLS model using both truncated observed and truncated predicted demands diverge from the simulated consumer surplus for both truncation rates. In normal right-skewed distributions, consumer surplus estimates from the TSTLS model using truncated observed demand diverge from the simulated consumer surplus for both truncation rates. Slight underestimation results when consumer surplus estimates are calculated from truncated predicted demand.

In cases of normality, consumer surplus estimates derived from the TB&J model using both truncated observed and truncated predicted demands diverge from the simulated consumer surplus for both truncation rates. Under normal left- and right-skewed error distributions, consumer surplus estimates from the TB&J model using both truncated observed and truncated predicted demands

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[2] Similar results were obtained for both sample sizes of 125 and 500. For purposes of brevity, results from the small sample size are omitted.

[3] A more comprehensive discussion of the results can be obtained from the authors upon request.

diverge considerably from the simulated consumer surplus for both truncation rates.

Considering non-normal Cauchy and Laplace distributions, consumer surplus estimates computed from the TMLE model using both truncated observed and truncated predicted demands do not accurately converge to the simulated consumer surplus for both truncation rates. Under conditions of non-normal Laplace distribution, consumer surplus estimates derived from the TSTLS model using truncated observed demand diverge from the simulated consumer surplus for both truncation rates. When consumer surplus estimates are computed from the TSTLS model using truncated predicted demand, convergence results for 25% truncation rate, although divergence still persist when truncation is 50%. Under non-normal Cauchy error distribution, consumer surplus estimates derived from the TSTLS model using truncated observed demand diverge from the simulated consumer surplus for both truncation rates. When consumer surplus estimates are computed from the TSTLS model using truncated predicted demand, convergence to simulated consumer surplus results as sample size increases for both truncation rates. Under conditions of non-normal Cauchy and Laplace distributions, consumer surplus estimates calculated from the TB&J model using both truncated observed and truncated predicted demands diverge considerably from the simulated consumer surplus for both truncation rates.

Under heteroscedasticity, consumer surplus from all three TMLE, TSTLS, and TB&J models using both truncated observed and truncated predicted demands diverge from the simulated consumer surplus for both truncation rates.

CONCLUDING COMMENTS

Results of the Monte Carlo experiments suggest that with the exception of a few isolated cases involving the TSTLS, consumer surplus from all three truncated parametric and even semiparametric models examined yield consumer surplus that excessively overestimates the simulated consumer surplus. The magnitude of overestimation by these models often exceed 70%.

As such, truncated recreation demand studies warrant further investigation. Given that results from even semiparametric models tend to be excessively overestimated, researchers should cease using on-site sample surveys. As it turns out, omitting nonvisitors from the sample can signicantly affect regression estimates. Nonvisitors may possess nonuse values such as option values if they believe that they may wish to visit the environmental amenity in the future or

existence values if they do not intend to visit but value knowing that the amenity exists.

In addition, future research could focus on alternative truncated models that appropriately accounts for the truncation problem as this issue has not been adequately addressed in the econometric literature.

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Table 1: Descriptive Statistics of the Monte Carlo Experiments

	Descriptive Statistic	Formula
1.	Mean Consumer Surplus (MCS)[a]	$(1/n)\Sigma_i CS_i$
2.	Mean Simulated Consumer Surplus (MCSS)[b]	$(1/n)\Sigma_i CSS_i$
3.	Mean Error of Consumer Surplus (ME)	MCS - MCSS
4.	Mean Proportional Error of Consumer Surplus (MPE)	$(1/n)\Sigma_i[(CS_i - CSS_i)/CSS_i]$
5.	Root-Mean-Square-Error of Consumer Surplus (RMSE)	$[(1/n)\Sigma_i(CS_i - CSS_i)^2]^{1/2}$
6.	Mean Error as a Proportion of Simulated Consumer Surplus (MEC)	ME/MCSS
7.	Number of Replications (n)	250

[a] The individual consumer surplus is computed from truncated observed and predicted demands. For the truncated observed demand case, equation (6) is computed using the estimated price coefficients of the TMLE, TSTLS, and TB&J models. For the truncated predicted demand case, equation (10) is computed using the estimated regression parameters of the TSTLS and TB&J models, with the limits of integration being the maximum price and zero. Concurrently, equation (12) is computed using the estimated regression parameters of the TMLE model, with the limits of integration set at the maximum price and zero.

[b] The simulated individual consumer surplus (CSS) is computed from the truncated observed and predicted demands. For the truncated observed demand case, equation (6) is computed using the simulated price coefficient (-0.2). For the truncated predicted demand case, equation (10) is numerically computed using the simulated regression coefficients and the estimated empirical distribution, while equation (12) is numerically computed using the simulated regression coefficients and the standard normal distribution.

Table 2: Monte Carlo Results of Consumer Surplus Based on Truncated Observed Demand (N = 500; 25% Truncation)

Model	MCS	ME	MPE	RMSE	MEC
			Normal Distribution		
TMLE	$1508.03	$1032.93	2.18	1106.16	2.17
TSTLS	$890.31	$415.22	0.88	563.15	0.87
TB&J	$918.36	$443.27	0.94	504.93	0.93
			Normal Distribution (Right-Skewed)		
TMLE	$3322.70	$2850.98	6.12	13932.88	6.04
TSTLS	$909.60	$437.88	0.93	482.49	0.93
TB&J	$2046.91	$1575.19	3.38	8531.27	3.34
			Normal Distribution (Left-Skewed)		
TMLE	$545.27	$323.63	1.47	330.21	1.46
TSTLS	$297.48	$75.84	0.35	84.46	0.34
TB&J	$331.57	$109.93	0.50	117.10	0.50
			Laplace Distribution		
TMLE	$1121.61	$738.64	1.94	792.18	1.93
TSTLS	$583.18	$200.20	0.53	231.01	0.52
TB&J	$686.12	$303.14	0.80	349.72	0.79
			Cauchy Distribution		
TMLE	$25784.97	$18596.99	8.51	164747.27	2.59
TSTLS	$8518.78	$1330.80	0.21	7090.04	0.19
TB&J	$16561.66	$9373.67	5.06	106672.43	1.30
			Heteroscedastic Distribution		
TMLE	$2673.50	$1889.95	2.42	2243.79	2.41
TSTLS	$1722.47	$938.92	1.23	2398.48	1.20
TB&J	$1631.30	$847.75	1.09	1125.03	1.08

Table 3: Monte Carlo Results of Consumer Surplus Based on Truncated Observed Demand (N=500; 50% Truncation)

Model	MCS	ME	MPE	RMSE	MEC
		Normal Distribution			
TMLE	$1332.30	$1058.83	3.88	1211.69	3.87
TSTLS	$864.17	$590.70	2.16	804.03	2.16
TB&J	$814.48	$541.01	1.98	649.57	1.98
		Normal Distribution (Right-Skewed)			
TMLE	$20636.73	$20190.39	45.61	72873.47	45.24
TSTLS	$3248.77	$2802.43	6.25	3899.65	6.28
TB&J	$12964.71	$12518.37	28.26	47376.08	28.05
		Normal Distribution (Left-Skewed)			
TMLE	$439.62	$326.78	2.91	335.95	2.90
TSTLS	$252.94	$140.10	1.25	147.23	1.24
TB&J	$269.27	$156.43	1.40	163.53	1.39
		Laplace Distribution			
TMLE	$3406.74	$3134.74	11.44	6175.26	11.52
TSTLS	$1360.22	$1088.08	3.96	1545.12	4.00
TB&J	$2096.29	$1824.15	6.65	3745.89	6.70
		Cauchy Distribution			
TMLE	$169899.68	-$4333259.55	432.04	70197432.48	-0.96
TSTLS	$11655318.57	$7152159.34	1.11	111821515.57	1.59
TB&J	$108809.03	-$4394350.20	272.84	70237198.92	-0.98
		Heteroscedastic Distribution			
TMLE	$4824.39	$4312.43	8.58	24124.20	8.42
TSTLS	$6647.75	$6135.79	12.03	75392.38	11.98
TB&J	$2811.09	$2299.13	4.56	12984.98	4.49

Table 4: Monte Carlo Results of Consumer Surplus Based on Truncated Predicted Demand (N = 500; 25% Truncation)

Model	MCS	ME	MPE	RMSE	MEC
		Normal Distribution			
TMLE	$7494.76	$7112.64	18.61	7123.14	18.61
TSTLS	$1103.22	$111.15	0.11	113.64	0.11
TB&J	$1169.57	$177.50	0.18	178.57	0.18
		Normal Distribution (Right-Skewed)			
TMLE	$7366.24	$7014.19	19.92	7044.02	19.92
TSTLS	$841.18	-$46.19	-0.05	49.21	-0.05
TB&J	$990.84	$103.47	0.12	106.04	0.12
		Normal Distribution (Left-Skewed)			
TMLE	$3421.55	$3217.00	15.73	3222.46	15.73
TSTLS	$789.90	$165.90	0.27	166.44	0.27
TB&J	$816.92	$192.92	0.31	193.29	0.31
		Laplace Distribution			
TMLE	$6000.55	$5692.24	18.46	5711.39	18.46
TSTLS	$910.11	$81.86	0.10	83.78	0.10
TB&J	$996.41	$168.16	0.20	169.15	0.20
		Cauchy Distribution			
TMLE	$12860.58	$12679.45	70.17	19275.31	70.00
TSTLS	$521.61	$10.84	0.02	12.71	0.02
TB&J	$624.72	$113.94	0.22	127.57	0.22
		Heteroscedastic Distribution			
TMLE	$12087.01	$11628.37	25.35	11648.85	25.35
TSTLS	$1388.35	$176.80	0.15	179.15	0.15
TB&J	$1485.56	$274.01	0.23	275.08	0.23

Table 5: Monte Carlo Results of Consumer Surplus Based on Truncated Predicted Demand (N = 500; 50% Truncation)

Model	MCS	ME	MPE	RMSE	MEC
		Normal Distribution			
TMLE	$4312.70	$4220.09	45.64	4228.85	45.57
TSTLS	$774.48	$266.51	0.52	267.22	0.52
TB&J	$849.52	$341.55	0.67	341.96	0.67
		Normal Distribution (Right-Skewed)			
TMLE	$6928.74	$6789.09	48.63	6822.14	48.62
TSTLS	$719.01	$60.29	0.09	62.82	0.09
TB&J	$903.81	$245.09	0.37	246.33	0.37
		Normal Distribution (Left-Skewed)			
TMLE	$1743.08	$1719.86	75.18	1724.64	74.04
TSTLS	$496.97	$244.02	0.97	244.35	0.96
TB&J	$538.03	$285.09	1.13	285.30	1.13
		Laplace Distribution			
TMLE	$4265.20	$4177.82	47.87	4197.91	47.81
TSTLS	$661.73	$180.03	0.37	180.69	0.37
TB&J	$766.71	$285.01	0.59	285.53	0.59
		Cauchy Distribution			
TMLE	$19769.56	$19697.15	273.16	31168.31	272.01
TSTLS	$410.79	$14.48	0.05	22.81	0.04
TB&J	$568.73	$172.41	0.42	188.78	0.44
		Heteroscedastic Distribution			
TMLE	$7776.05	$7672.08	73.85	7693.17	73.79
TSTLS	$1044.42	$388.36	0.59	389.35	0.59
TB&J	$1153.79	$497.73	0.76	498.33	0.76

ULASAN BUKU/BOOK REVIEWS

East Asian Economies: The Miracle, A Crisis and the Future, by Bhanoji Rao, Singapore: McGraw Hill, 2001, 1-175pp. index

In the course of their sojourn from the miracle days of 1980s to the gloomy days of financial debacles of late 1990s, the East Asian economies have indeed created history. The present book by Bhanoji Rao is an attempt to analyse the miracle, the 1997 crisis and the future potential of the studied regions. Chapter I of the book is unusually short (only two pages) and delineates the plan of the book. Chapters II and III explain the "East Asian miracle"; chapters IV and V analyse the economic crisis of 1997; the possible future of these regional economies is prognosticated in Chapter VI of the book, while Chapter VII considers how these economies can evolve in line with an expanded concept of development.

In Chapter II, the growth experience of the miracle economies between 1950-90 is considered. The four NIES (Hong Kong, South Korea, Singapore and Taiwan) achieved record growth in the second half of the last century, and the growth performance of Indonesia, Malaysia and Thailand, though somewhat lower, is still commendable. While explaining the basic sources of economic growth in these economies, Rao has convincingly demonstrated the contributions of domestic savings, investment flows, export orientation, human resource development, market-state synergy and total factor productivity growth.

However, a number of important issues have not been clarified. First, in the context of the economic growth of these countries, the issue of the so-called "miracle" itself has become a subject of debate. Many scholars of the East Asian economies (EAE) argue that the World Bank's perception of the "miracle" is not really correct. These economies, by virtue of their high savings, high investment, better human capital, political and economic stability and so on, have been able to achieve the high growth rate, and it is therefore not a windfall or a miracle. Second, in the explanation of the causes and empirical sources of growth of the EAE, opinion is divided as to whether such high growth is technology-driven or investment-induced, and the dust and din of the polemics is not yet settled. Third, it is strongly felt by many, including the present reviewer, that the high growth was made possible by their integration with the capitalist economies and the introduction of the capitalist relations in production and distribution. Fourth, the fact that the high rate of growth is not necessarily the optimum rate for these economies was realised only during the economic crisis of 1997 which unfolded several macroeconomic weaknesses. Fifth, the invisible hand of the state was responsible as much for the growth as

for the generation of moral hazard and the political economy of cronyism. These became responsible, at least partly, for the financial crisis of these economies.

Chapter III, analysing growth, poverty and inequality is one of the well-written and well-conceived chapters in the book. As the author observes, while absolute poverty has been considerably reduced in these economies, the same is not true of income inequality. He has rightly pointed out the misconceived notions of the World Bank in this connection. However, Rao has given more space and emphasis to the explanation of inequality rather than absolute poverty. This is understandable because the study of inequality is his forte, and he has written much on the issue. However, his data are not up-to-date. Had he used the recent data, he would have found that in all these economies except Thailand, the inverted 'U' hypothesis of Kuznets does not apply. These economies, at the initial stage of their development, experienced reductions in income inequality, but were marked by a higher rate of economic growth, later and income inequalities started increasing (Ghosh, 2001). This implies a 'U' pattern of income inequality and is exactly opposite to the Kuznets hypothesis.

While discussing the income data of the EAE, Rao has explained the problems of comparing income data from household surveys and national income accounts. In fact, he realises that survey estimates of income may form different percentages of GNP overtime, and this may affect the accuracy of Gini coefficients estimated from household surveys. But surprisingly, the book does not mention the seminal work on generating internationally comparable income distribution estimates made by Ginneken and Jong-goo Park (ILO, 1984) who have made similar observations.

Chapter IV of the book which deals with crisis may not satisfy well-informed readers. Rao thinks that since every economy has had different types of weaknesses and problems, it is not correct to explain away the crisis as the effect of *contagion.* He has been critical about the explanation of different authorities regarding the genesis of the crisis of 1997 and argues that none has gone to the root cause of the crisis, which, according to him, is the loss of confidence. One may ask: what is the root cause of the loss of confidence? Rao has not directly answered the question, although he has pinpointed many factors such as current accounts deficit, export decline and so forth. He could have examined in this connection the macro vulnerability theory of crisis, which seems to be more relevant for the East Asian crisis, but is not emphasised by many. As a matter of fact, one becomes a prisoner of one's own insight if it is not realised that without the manifestation of macroeconomic debility at the surface, there cannot be a general loss of confidence. Needless to add, many types of internal and external macro vulnerabilities became evident in all these

crisis-affected countries. Among the growing domestic macroeconomic weaknesses were the increasing ICOR, labour productivity lagging behind wages, appreciation of the real exchange rate and so on. In Chapter II of the book, Rao, in an altogether different context, cited data for the ICOR of these countries, which reveal that compared to 1980-89, the average ICOR in some of these countries declined in 1990-96 (p.18). Interestingly, however, the data cited by Radelet and Sachs (1998) in their famous study found that in all these countries, the ICOR in 1993-94 was higher than that in 1987-89.

Rao's sweeping statement that, "if the currency crisis were to lead to a financial crisis, then it is wise to approach the IMF"(p. 63), is counterfactual and can be contested by many in view of the IMF's wrong prescription for these countries. The IMF prescribed the standard kitchen menu that was once relevant for combating inflation in some of the South American economies; but it was not suitable for the East Asian countries which were initially experiencing recession, and the application of the prescription put some of these economies into deep crisis. This is borne out by the experiences of Indonesia, Thailand and Korea who opted for the IMF bail out. The egregious outcome of the havoc, both political and economic, created by the wrong order of the IMF to close down 16 commercial banks of Indonesia is very much in the public domain.

Chapter V of the book is devoted to country reviews and IMF programmes. Rao delineates the factors which are responsible for the crisis of confidence for each of these countries. What he really explains is the macroeconomic vulnerability of these countries. All this implies that his statement that the root cause of the crisis was the crisis of confidence (p. 62) is not the teleological explanation. He should have used a footnote to say that the root cause of the loss of confidence will be explained later in Chapter V. At many places in chapter five, he mentions the inefficacy of the IMF package (pp. 79, 86, 87 and 90) and also its involvement in the sacking of two ministers during the regime of President Wahid in Indonesia. Surprisingly, Rao still maintains that during financial currency crisis, it is a wise policy to approach the IMF (p. 62). This is a clear case of internal contradiction which a reader does not expect from a seasoned researcher like Rao.

While explaining the working of capital controls in Malaysia, the author makes a few unfounded remarks. Some of these are: "the fall of the ringgit was often propelled by the comments and pronouncements of the outspoken prime minister against Jews", "There were other reasons for loss of confidence in the Malaysian leadership" The refusal of Malaysia to seek IMF assistance was seen as a possible weakness and a lack of commitment to reforms of the financial

sector", and " The growing lack of confidence in the economy could only mean that the flow of foreign funds could dry up".

All the above statements are misconstrued and are not based on any substratum of truth. There never occurred, at any point of time during the crisis any overt loss of confidence in the Malaysian leadership, and the refusal to seek the help of the IMF does not in any way prove the lack of commitment for the financial sector reform. The IMF was avoided because of its political bias and perhaps because of its infamous wrong policy package which could have done more harm than good. And perhaps the author is not aware of the popular support that the leadership earned for not resorting to the IMF bail out. Rao is also not correct in his perception of the possibility of drying sources of foreign funds for Malaysia. Patvinder Singh's article (*New Straits Time*, 19 June, 1999) on the subject proves that Rao's apprehension was prejudiced, and that Malaysia could substantially recover because of the constant inflow of foreign funds. However, Rao is true in his assertion that the real test of the working of the capital controls in Malaysia would be known when such controls are lifted. The last portion of the chapter discusses in brief the reformation of the international financial system including the IMF.

Chapter VII of the book analyses the prospects and challenges. Rao observes that since the time of asset price bursting in 1990, the prospect of Japan to be the leader in this region has become altogether bleak, and the prospect of China has become rather brighter. But China has to resolve a number of challenges like obsolete legal system, inefficient state enterprises, increasing income inequalities, growing corruption and the like. Why does the author bother too much about Japan and China? They are not in any way a part of East Asia? Rao observes that Singapore and South Korea need to make many reforms and new strategies to increase their contestability. The author seems to be correct in emphasising the need for decreasing ICOR, reducing income inequality, TFP-driven growth, development of the robust financial system and better management of the problems arising out of globalisation. However, a number of items missed by the author can be added to the list, such as the reduction in short-term debt, better fiscal-monetary management, maintenance of internal and external balances and so forth. Rao makes a sane suggestion that capital account liberalisation should be avoided if such a regime cannot be managed properly. But in spite of noting the causes of crisis and the reasons for the loss of confidence, Rao still maintains that East Asia has sound macroeconomic fundamentals (p.113). If this is true, then chapters four, five and partly six of the book become redundant, and the logical basis of his earlier analysis would be contradicted, especially of chapter IV.

Chapter VII of the book on freedom and values is built on idealistic overtones, and obviously therefore, many of the assertions cannot be proved or disproved. Some of the assertions made by Rao are:

> "As that society marches forward on the development scale, the population will adhere to truth increasingly."
> "As long as human beings do not increasingly manifest the core human values of non-violence and truth, economies will be prone to crisis."
> "Market power achieved through corrupt means will be short-lived."
> "Markets and states need not fail if all actors adhere to truth".

The chapter is littered with many such statements which are metaphysical in nature. Hence the Popperian principle of falsifiability cannot be invoked through empiricism. Rao defines development as the process of achieving the trinity of human capability, freedom and movement towards human perfection. Good enough. But in a modern industrial society what seems to be more crucial is not so much the human capability as the human contestability. Contestability is the manifested overt ability to prove the capability in the arena of market. In fact, development is not meaningfully correlated to truth and non-violence. Table 7.2 cited by Rao reveals that comparatively developed countries/regions have high corruption index

He has cogently argued the case for more democracy and freedom in the EAE. However, Rao should remember that people get the type of government that they deserve. All said it must be admitted that it is not development qua development that leads the society or human beings towards perfection, as Rao contemplates; but it is more the individual values at the micro level that matter irrespective of the tempo of development and material progress.

The book deals with many things about the EAE without delving much into details. They say that a scholarly work is one which analyses more and more about less and less; and a philosophical work is one which pontificates less and less about more and more. The academic status of the present volume falls somewhere in between these two extremes. However, on the whole, the book remains highly informative and fairly analytical; it is an important source of data. But the putative value of the book could have been considerably enhanced if it had incorporated two separate chapters - one on education and economic growth in the EAE, and the other on the contemporary issues in the macroeconomic management of these countries; recast the chapter on inequality in the light of the Kuznets hypothesis, inserted a section on the lessons of the recent financial crisis and added more flesh to the skeletal discussion on the financial sector reforms in these economies. But all these suggestions might

sound like a glutton asking for too many things on the plate all at once to satisfy his uncanny voracity!

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