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# Theories of ultrasonic velocities and their application in the binary liquid mixtures of ethyl benzoate with 2-alkoxyethanols at different temperatures

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## ABSTRACT

Ultrasonic velocities and densities of the binary liquid mixtures of ethyl benzoate with 2-methoxyethanol, 2ethoxyethanol and 2-butoxyethanol have been measured over the entire composition range of mole fractions at a temperature range from 303.15 to 318.15 K with an interval of 5 K. The theoretical values of ultrasonic velocity were evaluated by using Nomoto (NOM), Impedance (IMP), Van Deal and Vangeel (VDV), Junjie's (JUN), Rao's specific velocity (RAO) models. The results were discussed in terms of non-ideality in the mixtures, molecular interaction parameter, relative deviation  $\sigma$  and Chi-square ( $\chi^2$ ) test for the goodness of the fit is applied to understand the applicability of these theories to the present systems.

Keywords: Ethylbenzoate, ultrasonic velocities, Chi-square test, molecular interaction parameter.

### INTRODUCTION

The measurement of ultrasonic velocities finds extensive applications in understanding physico-chemical behaviour of liquid mixtures [1-11]. Ultrasonic velocities of liquid mixtures containing polar and non-polar groups are of considerable importance in understanding intermolecular interaction between component molecules [12-21]. Many researchers compared the experimental values of ultrasonic velocities with theoretically evaluated values for organic liquid mixtures using different theories/ models like Nomoto [22], impedance relation [23], Van Dael and Vangeel [24], Junjie's [25] and Rao's specific velocity [26]. The present study is a continuation of our research programme on the application of theoretical models of ultrasonic velocities for some liquid binaries at different temperatures [27-32].

In this paper, we report the experimental and theoretical ultrasonic velocities of ethyl benzoate with 2methoxyethanol, 2-ethoxyethanol and 2-butoxyethanol evaluated by various theoretical models such as Nomoto (NOM), Impedance (IMP), Van Deal and Vangeel (VDV), Junjie's (JUN), Rao's specific velocity (RAO) at 303.15-318.15K over the entire composition range. Relative applicability of the theories to the present systems has been checked and discussed. Further, the results were explained in terms of molecular interaction parameter, deviation in the variation of  $U^2_{exp}/U^2_{imx}$ , relative deviation  $\sigma$  and Chi-square ( $\chi^2$ ) test for the goodness of the fit is applied to understand the applicability of these theories to the present systems.

#### MATERIALS AND METHODS

The solvents used in the present study ethyl benzoate (EB) (Merk >99%) and 2-methoxyethanol (MOE), 2ethoxyethanol (EOE) and 2-butoxyethanol (BOE) are obtained from S.D fine chemicals India Ltd. They were purified as described in the literature [33,34]. The density was measured with a pycnometer having a bulb volume of about 25 cm<sup>3</sup> and an internal capillary diameter of about 1 mm. The density was then determined from the mass of the sample and the volume of pycnometer. Uncertainties in density determinations were estimated to be within  $\pm$  0.0001 g cm<sup>-3</sup>. The ultrasonic velocity of sound (U) is measured using an ultrasonic interferometer (Mittal Enterprises, New Delhi model F05) operating at 2 MHz. The measured speeds of sound have a precision of 0.8 m.sec<sup>-1</sup> and an uncertainty less than  $\pm$  0.1 m.sec<sup>-1</sup> and temperature stability was maintained within  $\pm$  0.01K by circulating water bath around the measuring cell through a pump.

#### THEORETICAL CONSIDERATIONS:

1.1 Nomoto theory: Nomoto's empirical formula is based on the assumption of the linear dependence of the molecular sound velocity on concentration and the additivity of the molar volume in the liquid mixture. The sound velocity U is given by

$$U = \left[\frac{\sum_{i=1}^{n} x_i R_i}{\sum_{i=1}^{n} x_i V_i}\right]^3$$

where the molar sound velocity  $R = x_1 R_1 + x_2 R_2$ .

Hence, ultrasonic velocity (U) is given by

In the above equation  $R_i = (M_i/\rho_i) U_i^{1/3} = V_i (U_i)^{1/3}$ 

*1.2 Impedance relation:* The specific acoustic impedance of the pure liquids are used for evaluating the ultrasonic velocity in the liquid mixtures by the following relation:

Where  $Z_i$  is acoustic impedance and  $\rho_i$  is the density of the mixture.

1.3 Van Dael and Vangeel relation: Van Dael and Vangeel obtained the formula for ultrasonic velocity in the liquid mixtures adopting the adiabatic compressibilities of the pure liquids based on ideal mixing of the liquids. Van Dael and Vangeel assumed that the adiabatic compressibility ( $\beta_{ad}$ ) of the mixture is given by

$$\beta_{ad} = \phi_A (\beta_{ad})_A + \phi_B (\beta_{ad})_B$$

and suggested the following relation for sound velocity in homogeneous liquid mixtures.

$$\beta_{ad}^{im} = \phi_{\rm A} \frac{\gamma_{\rm A}}{\gamma^{im}} (\beta_{ad})_A + \phi_{\rm B} \frac{\gamma_{\rm B}}{\gamma^{im}} (\beta_{ad})_B$$

where  $\phi$  and  $\gamma$  refer the volume function and principal specific ratio.

It holds true if the mixture is an ideal one and also  $\gamma_A = \gamma_B = \gamma_{im}$ . It can be transformed into a linear combination of the mole fractions if the additional assumption  $v_A = v_B$  is made

 $\beta_{ad}^{im} = x_A (\beta_{ad})_A + x_B (\beta_{ad})_B$ 

The sound velocities appropriate to the above equations are given by

*1.4 Junjie relation:* This relation derived by Junjie for the ultrasonic velocity of the mixture in terms of the mole fraction, molecular weight and density of the mixture.

$$U = \frac{\sum_{i=1}^{n} x_i V_i}{(\sum_{i=1}^{n} x_i M_i)^{1/2} (\sum_{i=1}^{n} x_i V_i / \rho_i u_i^2)^{1/2}} \qquad \dots \dots (4)$$

where the symbols have their usual meanings.

1.5 Rao's relation: Using the ratio of the temperature coefficient of velocity and expansion coefficient, Rao derived a formula for ultrasonic velocity (U)

$$U = \left(\frac{R}{V}\right)^3 \tag{5}$$

where V is the molar volume and R is called Rao's constant or molar sound velocity, which is constant for a liquid at a temperature.

#### Chi-square test for goodness of fit:

According to Karl Pearson, Chi-square value is evaluated for the binary liquid mixtures under study using the formula

where n is the number of data used,

and ' $U_{(obs)}$  = experimental values of ultrasonic velocities  $U_{(cal)}$  = computed values of ultrasonic velocities

#### Relative percentage of error $(\sigma)$ :

The Average percentage error is calculated by using the relation

 $\sigma = 1/n \sum ((U_{\text{(obs)}} - U_{\text{(cal)}}) / U_{\text{(obs)}}) \times 100\%$  .....(7)

where n is the number of data used. U  $_{(obs)}$  = experimental values of ultrasonic velocities

#### Molecular associations:

The degree of intermolecular interaction or molecular association is given by

 $\boldsymbol{\alpha} = [\mathbf{U}_{exp}^2/\mathbf{U}_{imx}^2] - 1$ 

## **RESULTS AND DISCUSSION**

The experimental ultrasonic velocities and the theoretical values evaluated by Nomoto's Relation (NOM), Impedance Relation (IMP), Van Deal and Vangeel Ideal Mixing Relation (VDV), Junjie's relation (JUN), Rao's specific velocity method (RAO) are compared for all the three binaries ethyl benzoate + MOE, ethyl benzoate + EOE, ethyl benzoate + BOE along with the percentage of deviations are presented in TABLES 1-3 at all the four temperatures 303.15, 308.15, 313.15 & 318.15 K and atmospheric pressure. The validity of different theoretical formulae is checked by the chi-square test for all the mixtures at all the temperatures and the values are given in TABLE-4.

						TABLE-1						
EXPERIN	MENTAL A	ND THEO	RETICAL	VALUES (	OF VELOC	ITIES WIT	H THEIR 9	6 DEVIAT	IONS FOR	THE SYST	TEM (EB +	MOE)
						AT 303.1	5K					
$\mathbf{X}_1$	EXP	NOM	IMP	VDV	JUN	RAO	%NOM	%IMP	%VDV	%JUN	%RAO	α
0.0000	1324	1324.0	1324.0	1324.0	1324.0	1324.0	0.00	0.00	0.00	0.00	0.00	0.0000
0.0578	1326.358	1326.2	1325.4	1307.7	1325.6	1350.0	-0.01	-0.07	-1.41	-0.06	1.79	0.0288
0.1212	1328.824	1328.4	1326.9	1292.8	1327.3	1373.1	-0.03	-0.14	-2.71	-0.12	3.33	0.0566
0.1913	1331.342	1330.6	1328.5	1279.6	1329.1	1394.4	-0.05	-0.21	-3.88	-0.17	4.74	0.0824
0.2689	1333.9	1332.9	1330.4	1268.9	1331.1	1411.6	-0.08	-0.27	-4.88	-0.21	5.83	0.1051
0.3556	1336.48	1335.1	1332.3	1261.2	1333.3	1423.1	-0.11	-0.31	-5.63	-0.24	6.48	0.1230
0.4529	1339.038	1337.3	1334.5	1257.7	1335.6	1428.8	-0.13	-0.34	-6.07	-0.26	6.70	0.1335
0.5629	1341.456	1339.5	1337.0	1260.2	1338.0	1428.6	-0.14	-0.34	-6.05	-0.26	6.50	0.1330
0.6882	1343.612	1341.7	1339.7	1271.7	1340.6	1419.4	-0.14	-0.29	-5.35	-0.23	5.64	0.1164
0.8324	1345.302	1344.0	1342.7	1297.0	1343.3	1394.2	-0.10	-0.19	-3.59	-0.15	3.64	0.0758
1.0000	1346.2	1346.2	1346.2	1346.2	1346.2	1346.2	0.00	0.00	0.00	0.00	0.00	0.0000
						AT 308.1	5K					
$X_1$	EXP	NOM	IMP	VDV	JUN	RAO	%NOM	%IMP	%VDV	%JUN	%RAO	α
0.0000	1314.6	1314.6	1314.6	1314.6	1314.6	1314.6	0.00	0.00	0.00	0.00	0.00	0.0000
0.0578	1314.0	1316.3	1314.0	1208.3	1315.7	13/5 1	-0.02	-0.06	-1 30	-0.06	2.17	0.0000
0.1212	1310.5	1318.0	1315.7	1290.5	1317.0	1345.1	-0.02	-0.00	2.67	0.11	2.17	0.0205
0.1212	1220.5	1210.0	1210.9	1205.5	1219 /	1309.7	-0.03	-0.12	-2.07	-0.11	5.00	0.0550
0.1915	1320.5	1221.5	1210.5	1270.1	1210.4	1309.9	-0.00	-0.16	-3.62	-0.10	5.25	0.0010
0.2009	1322.0	1222.2	1221 1	1259.2	1221.6	1407.7	-0.08	-0.25	-4.79	-0.20	0.44	0.1055
0.3330	1226.6	1225.0	1222.0	1231.5	1222.4	1421.0	-0.11	-0.27	-5.54	-0.25	7.52	0.1207
0.4329	1320.0	1323.0	1322.8	1247.5	1323.4	1427.2	-0.15	-0.29	-3.97	-0.25	7.38	0.1202
0.3629	1328.3	1320.7	1324.7	1249.0	1525.5	1427.5	-0.14	-0.29	-5.94	-0.24	1.45	0.1505
0.6882	1330.1	1328.4	1326.8	1260.3	1327.4	1416.0	-0.13	-0.25	-5.25	-0.21	6.45	0.1139
0.8324	1331.4	1330.2	1329.2	1284.6	1329.6	1386.6	-0.09	-0.16	-3.51	-0.14	4.15	0.0742
1.0000	1331.9	1331.9	1331.9	1331.9	1331.9	1331.9	0.00	0.00	0.00	0.00	0.00	0.0000
						AI 313.1	5К					
$X_1$	EXP	NOM	IMP	VDV	JUN	RAO	%NOM	%IMP	%VDV	%JUN	%RAO	α
0.0000	1291.2	1291.2	1291.2	1291.2	1291.2	1291.2	0.00	0.00	0.00	0.00	0.00	0.0000
0.0578	1293.5	1293.7	1292.8	1275.4	1293.0	1321.5	0.02	-0.05	-1.40	-0.04	2.17	0.0286
0.1212	1295.8	1296.1	1294.4	1260.9	1295.0	1349.4	0.02	-0.11	-2.69	-0.07	4.13	0.0561
0.1913	1298.3	1298.6	1296.3	1248.3	1297.0	1370.8	0.02	-0.15	-3.85	-0.10	5.58	0.0818
0.2689	1300.9	1301.1	1298.3	1237.9	1299.3	1390.1	0.02	-0.20	-4.84	-0.12	6.86	0.1043
0.3556	1303.5	1303.6	1300.5	1230.6	1301.7	1405.2	0.01	-0.23	-5.59	-0.14	7.81	0.1220
0.4529	1306.2	1306.0	1303.0	1227.4	1304.2	1415.9	-0.01	-0.25	-6.03	-0.15	8.40	0.1325
0.5629	1308.9	1308.5	1305.7	1230.2	1306.9	1418.0	-0.03	-0.25	-6.02	-0.15	8.33	0.1321
0.6882	1311.5	1311.0	1308.7	1241.7	1309.8	1406.4	-0.04	-0.22	-5.32	-0.13	7.23	0.1156
0.8324	1314.0	1313.5	1312.1	1267.0	1312.8	1375.0	-0.03	-0.14	-3.57	-0.09	4.65	0.0754
1.0000	1316.0	1316.0	1316.0	1316.0	1316.0	1316.0	0.00	0.00	0.00	0.00	0.00	0.0000
						AT318.15	δK					
$X_1$	EXP	NOM	IMP	VDV	JUN	RAO	%NOM	%IMP	%VDV	%JUN	%RAO	α
0.0000	1000 6											0.0000
0.0578	1282.6	1282.6	1282.6	1282.6	1282.6	1282.6	0.00	0.00	0.00	0.00	0.00	0.0000
	1282.6	1282.6 1284.2	1282.6 1283.6	1282.6 1266.6	1282.6 1283.6	1282.6 1313.8	0.00 0.02	0.00 -0.03	0.00 -1.36	0.00 -0.03	0.00 2.32	0.0000
0.1212	1282.6 1284.0 1285.8	1282.6 1284.2 1285.8	1282.6 1283.6 1284.7	1282.6 1266.6 1252.0	1282.6 1283.6 1284.8	1282.6 1313.8 1340.0	0.00 0.02 0.00	0.00 -0.03 -0.09	0.00 -1.36 -2.63	0.00 -0.03 -0.07	0.00 2.32 4.22	0.0000 0.0277 0.0547
0.1212 0.1913	1282.6 1284.0 1285.8 1287.8	1282.6 1284.2 1285.8 1287.5	1282.6 1283.6 1284.7 1285.9	1282.6 1266.6 1252.0 1239.1	1282.6 1283.6 1284.8 1286.2	1282.6 1313.8 1340.0 1364.7	0.00 0.02 0.00 -0.03	0.00 -0.03 -0.09 -0.15	0.00 -1.36 -2.63 -3.78	0.00 -0.03 -0.07 -0.13	0.00 2.32 4.22 5.97	0.0277 0.0547 0.0802
0.1212 0.1913 0.2689	1282.6 1284.0 1285.8 1287.8 1289.7	1282.6 1284.2 1285.8 1287.5 1289.1	1282.6 1283.6 1284.7 1285.9 1287.3	1282.6 1266.6 1252.0 1239.1 1228.4	1282.6 1283.6 1284.8 1286.2 1287.6	1282.6 1313.8 1340.0 1364.7 1382.9	0.00 0.02 0.00 -0.03 -0.04	0.00 -0.03 -0.09 -0.15 -0.19	0.00 -1.36 -2.63 -3.78 -4.75	0.00 -0.03 -0.07 -0.13 -0.16	0.00 2.32 4.22 5.97 7.23	0.0000 0.0277 0.0547 0.0802 0.1022
0.1212 0.1913 0.2689 0.3556	1282.6 1284.0 1285.8 1287.8 1289.7 1291 5	1282.6 1284.2 1285.8 1287.5 1289.1 1290.8	1282.6 1283.6 1284.7 1285.9 1287.3 1288 7	1282.6 1266.6 1252.0 1239.1 1228.4 1220.7	1282.6 1283.6 1284.8 1286.2 1287.6 1289.2	1282.6 1313.8 1340.0 1364.7 1382.9 1399.0	0.00 0.02 0.00 -0.03 -0.04 -0.06	0.00 -0.03 -0.09 -0.15 -0.19 -0.22	0.00 -1.36 -2.63 -3.78 -4.75 -5.49	0.00 -0.03 -0.07 -0.13 -0.16 -0.18	0.00 2.32 4.22 5.97 7.23 8.32	0.0000 0.0277 0.0547 0.0802 0.1022 0.1194
0.1212 0.1913 0.2689 0.3556 0.4529	1282.6 1284.0 1285.8 1287.8 1289.7 1291.5 1293.4	1282.6 1284.2 1285.8 1287.5 1289.1 1290.8 1292.4	1282.6 1283.6 1284.7 1285.9 1287.3 1288.7 1290.4	1282.6 1266.6 1252.0 1239.1 1228.4 1220.7 1217.0	1282.6 1283.6 1284.8 1286.2 1287.6 1289.2 1290.9	1282.6 1313.8 1340.0 1364.7 1382.9 1399.0 1410.2	0.00 0.02 0.00 -0.03 -0.04 -0.06 -0.07	0.00 -0.03 -0.09 -0.15 -0.19 -0.22 -0.23	0.00 -1.36 -2.63 -3.78 -4.75 -5.49 -5.91	0.00 -0.03 -0.07 -0.13 -0.16 -0.18 -0.19	0.00 2.32 4.22 5.97 7.23 8.32 9.03	0.0000 0.0277 0.0547 0.0802 0.1022 0.1194 0.1295
0.1212 0.1913 0.2689 0.3556 0.4529 0.5629	1282.6 1284.0 1285.8 1287.8 1289.7 1291.5 1293.4 1295.2	1282.6 1284.2 1285.8 1287.5 1289.1 1290.8 1292.4 1294.1	1282.6 1283.6 1284.7 1285.9 1287.3 1288.7 1290.4 1292.2	1282.6 1266.6 1252.0 1239.1 1228.4 1220.7 1217.0 1219.0	1282.6 1283.6 1284.8 1286.2 1287.6 1289.2 1290.9 1292.7	1282.6 1313.8 1340.0 1364.7 1382.9 1399.0 1410.2 1411.3	0.00 0.02 0.00 -0.03 -0.04 -0.06 -0.07 -0.09	0.00 -0.03 -0.09 -0.15 -0.19 -0.22 -0.23 -0.23	0.00 -1.36 -2.63 -3.78 -4.75 -5.49 -5.91 -5.88	0.00 -0.03 -0.07 -0.13 -0.16 -0.18 -0.19 -0.19	0.00 2.32 4.22 5.97 7.23 8.32 9.03 8.97	0.0000 0.0277 0.0547 0.0802 0.1022 0.1194 0.1295 0.1290
0.1212 0.1913 0.2689 0.3556 0.4529 0.5629 0.6882	1282.6 1284.0 1285.8 1287.8 1289.7 1291.5 1293.4 1295.2 1296.8	1282.6 1284.2 1285.8 1287.5 1289.1 1290.8 1292.4 1292.4 1294.1 1295.7	1282.6 1283.6 1284.7 1285.9 1287.3 1288.7 1290.4 1292.2 1294.2	1282.6 1266.6 1252.0 1239.1 1228.4 1220.7 1217.0 1219.0 1229.4	1282.6 1283.6 1284.8 1286.2 1287.6 1289.2 1290.9 1292.7 1294.7	1282.6 1313.8 1340.0 1364.7 1382.9 1399.0 1410.2 1411.3 1397.6	0.00 0.02 0.00 -0.03 -0.04 -0.06 -0.07 -0.09 -0.09	0.00 -0.03 -0.09 -0.15 -0.19 -0.22 -0.23 -0.23 -0.23 -0.20	0.00 -1.36 -2.63 -3.78 -4.75 -5.49 -5.91 -5.88 -5.20	0.00 -0.03 -0.07 -0.13 -0.16 -0.18 -0.19 -0.19 -0.19	0.00 2.32 4.22 5.97 7.23 8.32 9.03 8.97 7.77	0.0000 0.0277 0.0547 0.0802 0.1022 0.1194 0.1295 0.1290 0.1127
0.1212 0.1913 0.2689 0.3556 0.4529 0.5629 0.6882 0.8324	1282.6 1284.0 1285.8 1287.8 1289.7 1291.5 1293.4 1295.2 1296.8 1298.1	1282.6 1284.2 1285.8 1287.5 1289.1 1290.8 1292.4 1294.1 1295.7 1297.4	1282.6 1283.6 1284.7 1285.9 1287.3 1288.7 1290.4 1292.2 1294.2 1296.4	1282.6 1266.6 1252.0 1239.1 1228.4 1220.7 1217.0 1219.0 1229.4 1253.0	1282.6 1283.6 1284.8 1286.2 1287.6 1289.2 1290.9 1292.7 1294.7 1296.8	1282.6 1313.8 1340.0 1364.7 1382.9 1399.0 1410.2 1411.3 1397.6 1362.9	0.00 0.02 0.00 -0.03 -0.04 -0.06 -0.07 -0.09 -0.09 -0.09	0.00 -0.03 -0.09 -0.15 -0.19 -0.22 -0.23 -0.23 -0.20 -0.13	0.00 -1.36 -2.63 -3.78 -4.75 -5.49 -5.91 -5.88 -5.20 -3.48	0.00 -0.03 -0.07 -0.13 -0.16 -0.18 -0.19 -0.19 -0.16 -0.11	0.00 2.32 4.22 5.97 7.23 8.32 9.03 8.97 7.77 4.99	$\begin{array}{c} 0.0000\\ 0.0277\\ 0.0547\\ 0.0802\\ 0.1022\\ 0.1194\\ 0.1295\\ 0.1290\\ 0.1127\\ 0.0734 \end{array}$
0.1212 0.1913 0.2689 0.3556 0.4529 0.5629 0.6882 0.8324 1.0000	1282.6 1284.0 1285.8 1287.8 1289.7 1291.5 1293.4 1295.2 1296.8 1298.1 1299.0	1282.6 1284.2 1285.8 1287.5 1289.1 1290.8 1292.4 1294.1 1295.7 1297.4 1299.0	1282.6 1283.6 1284.7 1285.9 1287.3 1288.7 1290.4 1292.2 1294.2 1296.4 1299.0	1282.6 1266.6 1252.0 1239.1 1228.4 1220.7 1217.0 1219.0 1229.4 1253.0 1299.0	1282.6 1283.6 1284.8 1286.2 1287.6 1289.2 1290.9 1292.7 1294.7 1296.8 1299.0	1282.6 1313.8 1340.0 1364.7 1382.9 1399.0 1410.2 1411.3 1397.6 1362.9 1299.0	0.00 0.02 0.00 -0.03 -0.04 -0.06 -0.07 -0.09 -0.09 -0.09 -0.06 0.00	0.00 -0.03 -0.09 -0.15 -0.19 -0.22 -0.23 -0.23 -0.20 -0.13 0.00	0.00 -1.36 -2.63 -3.78 -4.75 -5.49 -5.91 -5.88 -5.20 -3.48 0.00	0.00 -0.03 -0.07 -0.13 -0.16 -0.18 -0.19 -0.19 -0.16 -0.11 0.00	0.00 2.32 4.22 5.97 7.23 8.32 9.03 8.97 7.77 4.99 0.00	$\begin{array}{c} 0.0000\\ 0.0277\\ 0.0547\\ 0.0802\\ 0.1022\\ 0.1194\\ 0.1295\\ 0.1290\\ 0.1127\\ 0.0734\\ 0.0000 \end{array}$

						TABLE-2	2					
EXPERIN	MENTAL A	AND THEC	DRETICAL	VALUES	OF VELOC	CITIES WIT	THEIR 9	6 DEVIAT	TIONS FOR	THE SYS	TEM (EB +	EOE)
v	EVD	NOM	D.(D	VDV	ILINI	AI 303.1	SK WNOM					a
A <sub>1</sub>	EAP	NOM 1206-1	IMP	VDV 1206 1	JUN 1207 1	KAU	%NOM	%IMP	% V D V	%JUN	%KAU	u 0.0000
0.0000	1210.1	1210.1	1200.2	1306.0	1208.7	1221 6	0.00	0.00	0.00	0.00	0.00	0.0000
0.0701	1214.2	1214.1	1212.5	1290.0	1211.5	1252.0	0.00	-0.00	-1.05	-0.11	1.04	0.0210
0.1450	1219.2	1219.0	1216.0	1200.3	1214.7	1274.5	-0.01	-0.12	-1.95	-0.20	3.02 4.26	0.0402
0.2232	1210.5	1222.0	1210.7	1202.4	1219.2	1200.6	-0.02	-0.17	-2.75	-0.27	4.20	0.0308
0.3113	1322.5	1322.0	1222.5	1270.5	1222.0	1402.4	-0.05	-0.21	-3.34	-0.55	5.15	0.0703
0.4041	1320.7	1220.0	1323.3	1277.0	1322.0	1402.4	-0.05	-0.24	-3.75	-0.50	5.02	0.0794
0.5045	1225.0	1224.1	1221.0	1279.0	1220.1	1409.0	-0.07	-0.23	-3.90	-0.50	5.95	0.0629
0.0128	1330.1	1334.1	1336.3	1205.2	1335.5	1410.1	-0.07	-0.24	-3.14	-0.33	J.02 4.64	0.0791
0.8507	1342.8	13/2 2	13/11	1216.2	1340.6	1380.0	-0.07	-0.20	-1.08	-0.16	2.83	0.0000
1 0000	1346.2	1346.2	1346.2	1346.2	1346.2	1346.2	-0.05	-0.15	0.00	-0.10	0.00	0.0408
1.0000	1540.2	1540.2	1540.2	1540.2	1340.2	AT 308 1	5K	0.00	0.00	0.00	0.00	0.0000
Χ.	FXP	NOM	IMP	VDV	IIIN	RAO	%NOM	%IMP	%VDV	% II IN	%RAO	α
0.0000	1200 /	1200.4	1200.4	1200 /	1200 4	1200 4	0.00	0.00	0.00	0.00	0.00	0.0000
0.0000	1290.4	1290.4	1290.4	1290.4	1290.4	1290.4	0.00	-0.05	-1.02	-0.00	1.85	0.0000
0.1450	1294.2	1294.5	1295.7	1201.0	1295.1	1341.6	0.02	-0.03	-1.02	-0.09	3.34	0.0207
0.1450	1290.2	1298.0	1297.1	1273.2	1290.1	1341.0	0.04	-0.08	-1.92	-0.10	1.63	0.0550
0.2252	1302.2	1302.0	1304.4	1267.2	1203.1	1302.5	0.04	-0.12	-3.20	-0.21	5 50	0.0500
0.4041	1310.4	1311.1	1304.4	1262.1	1307.0	1392.8	0.04	-0.15	-3.70	-0.25	6.27	0.0073
0.5043	1314.9	1315.2	1312.6	1264.2	1311.3	1400.6	0.04	-0.18	-3.85	-0.27	6.52	0.0817
0.6128	1319.2	1319.4	1317.0	1204.2	1315.9	1400.8	0.03	-0.17	-3.69	-0.25	6.18	0.0781
0.7307	1323.6	1323.5	1321.7	1270.0	1320.9	1301.1	0.00	-0.14	-3.11	-0.20	5.10	0.0651
0.8592	1327.8	1323.5	1326.6	1202.4	1326.2	1369.1	-0.01	-0.09	-1.95	-0.12	3.11	0.0403
1 0000	1327.0	1331.9	1331.9	1331.9	1331.9	1331.9	0.00	0.00	0.00	0.00	0.00	0.0000
1.0000	1551.9	1551.9	1551.9	1551.9	1551.9	AT 313.1	5K	0.00	0.00	0.00	0.00	0.0000
$X_1$	EXP	NOM	IMP	VDV	JUN	RAO	%NOM	%IMP	%VDV	%JUN	%RAO	α
0.0000			1077.6	1277.6	1277.6	1277.6	0.00	0.00	0.00	0.00	0.00	0.0000
0.0000	1277.6	1277.6	12// 0			12//10	0.00	0.00	0.00		0.00	0.0202
0.0701	1277.6 1281.0	1277.6 1281.4	1277.6	1268.2	1280.0	1306.8	0.03	-0.03	-1.00	-0.08	2.01	0.0205
0.0701 0.1450	1277.6 1281.0 1284.5	1277.6 1281.4 1285.2	1277.6 1280.6 1283.8	1268.2 1260.4	1280.0 1282.8	1306.8 1331.3	0.03 0.05	-0.03 -0.06	-1.00 -1.88	-0.08 -0.14	2.01 3.64	0.0203
0.0701 0.1450 0.2252	1277.6 1281.0 1284.5 1288.2	1277.6 1281.4 1285.2 1289.0	1277.6 1280.6 1283.8 1287.1	1268.2 1260.4 1254.3	1280.0 1282.8 1285.8	1306.8 1331.3 1352.8	0.03 0.05 0.07	-0.03 -0.06 -0.08	-1.00 -1.88 -2.63	-0.08 -0.14 -0.19	2.01 3.64 5.02	0.0203 0.0387 0.0548
0.0701 0.1450 0.2252 0.3113	1277.6 1281.0 1284.5 1288.2 1292.0	1277.6 1281.4 1285.2 1289.0 1292.9	1277.6 1280.6 1283.8 1287.1 1290.6	1268.2 1260.4 1254.3 1250.3	1280.0 1282.8 1285.8 1289.1	1306.8 1331.3 1352.8 1370.5	0.03 0.05 0.07 0.07	-0.03 -0.06 -0.08 -0.11	-1.00 -1.88 -2.63 -3.22	-0.08 -0.14 -0.19 -0.22	2.01 3.64 5.02 6.08	0.0203 0.0387 0.0548 0.0677
0.0701 0.1450 0.2252 0.3113 0.4041	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3	1268.2 1260.4 1254.3 1250.3 1248.9	1280.0 1282.8 1285.8 1289.1 1292.8	1306.8 1331.3 1352.8 1370.5 1384.7	0.03 0.05 0.07 0.07 0.07	-0.03 -0.06 -0.08 -0.11 -0.12	-1.00 -1.88 -2.63 -3.22 -3.62	-0.08 -0.14 -0.19 -0.22 -0.23	2.01 3.64 5.02 6.08 6.86	0.0203 0.0387 0.0548 0.0677 0.0765
0.0701 0.1450 0.2252 0.3113 0.4041 0.5043	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1299.8	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8	1280.0 1282.8 1285.8 1289.1 1292.8 1296.7	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5	0.03 0.05 0.07 0.07 0.07 0.07	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23	2.01 3.64 5.02 6.08 6.86 7.14	0.0205 0.0387 0.0548 0.0677 0.0765 0.0799
0.0701 0.1450 0.2252 0.3113 0.4041 0.5043 0.6128	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1299.8 1303.8	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8	1280.0 1282.8 1285.8 1289.1 1292.8 1296.7 1301.0	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9	0.03 0.05 0.07 0.07 0.07 0.06 0.05	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21	2.01 3.64 5.02 6.08 6.86 7.14 6.76	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763
0.0701 0.1450 0.2252 0.3113 0.4041 0.5043 0.6128 0.7307	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1299.8 1303.8 1307.9	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2	1277.3 1280.0 1282.8 1285.8 1289.1 1292.8 1296.7 1301.0 1305.7	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9	0.03 0.05 0.07 0.07 0.07 0.06 0.05 0.03	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636
0.0701 0.1450 0.2252 0.3113 0.4041 0.5043 0.6128 0.7307 0.8592	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1299.8 1303.8 1307.9 1312.0	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9	1277.0 1280.0 1282.8 1285.8 1289.1 1292.8 1296.7 1301.0 1305.7 1310.7	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393
0.0701 0.1450 0.2252 0.3113 0.4041 0.5043 0.6128 0.7307 0.8592 1.0000	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1299.8 1303.8 1307.9 1312.0 1316.0	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0	1297.0 1280.0 1282.8 1285.8 1289.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0	0.03 0.05 0.07 0.07 0.07 0.06 0.05 0.03 0.01 0.00	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393 0.0000
0.0701 0.1450 0.2252 0.3113 0.4041 0.5043 0.6128 0.7307 0.8592 1.0000	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1299.8 1303.8 1307.9 1312.0 1316.0	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1256.8 1268.2 1286.9 1316.0	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1	0.03 0.05 0.07 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393 0.0000
0.0701 0.1450 0.2252 0.3113 0.4041 0.5043 0.6128 0.7307 0.8592 1.0000 X <sub>1</sub>	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1299.8 1303.8 1307.9 1312.0 1316.0 EXP	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1256.8 1268.2 1286.9 1316.0 VDV	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 % JUN	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393 0.0000
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \\ X_1\\ 0.0000 \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 % JUN 0.00	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393 0.0000 α
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \\ X_1\\ 0.0000\\ 0.0701 \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2 1257.2	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00 -0.01	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 % JUN 0.00 -0.05	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17	0.0203 0.0387 0.0548 0.0677 0.0763 0.0763 0.0636 0.0393 0.0000 α 0.0000
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \hline X_1\\ 0.0000\\ 0.0701\\ 0.1450\\ \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9 1261.7	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7 1263.1	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8 1261.4	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3 1237.9	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2 1257.2 1260.5	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1 1310.9	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06 0.11	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00 -0.01 -0.02	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00 -1.89	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 % JUN 0.00 -0.05 -0.10	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17 3.90	0.0203 0.0387 0.0548 0.0677 0.0765 0.0793 0.0636 0.0393 0.0000 α 0.0000 0.0203 0.0203 0.0389
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \hline X_1\\ 0.0000\\ 0.0701\\ 0.1450\\ 0.2252 \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9 1261.7 1265.7	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7 1263.1 1267.6	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8 1261.4 1265.3	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3 1237.9 1232.3	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2 1257.2 1260.5 1264.1	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1 1310.9 1333.4	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06 0.11 0.14	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00 -0.01 -0.02 -0.03	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00 -1.89 -2.64	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 %JUN 0.00 -0.05 -0.10 -0.13	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17 3.90 5.34	0.0203 0.0387 0.0548 0.0677 0.0765 0.0793 0.0636 0.0393 0.0000 α 0.0000 0.0203 0.0203 0.0389 0.0550
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \hline X_1\\ 0.0000\\ 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9 1261.7 1265.7 1265.7	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7 1263.1 1267.6 1272.0	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8 1261.4 1265.3 1269.4	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3 1237.9 1232.3 1228.8	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2 1257.2 1260.5 1264.1 1268.0	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1 1310.9 1333.4 1353.9	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06 0.11 0.14 0.17	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00 -0.01 -0.02 -0.03 -0.04	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00 -1.89 -2.64 -3.24	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 %JUN 0.00 -0.05 -0.10 -0.13 -0.15	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17 3.90 5.34 6.61	0.0203 0.0387 0.0548 0.0677 0.0765 0.0793 0.0636 0.0393 0.0000 α 0.0000 0.0203 0.0203 0.0389 0.0550 0.0680
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \hline X_1\\ 0.0000\\ 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9 1261.7 1265.7 1265.7 1269.9 1274.3	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7 1263.1 1267.6 1272.0 1276.5	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8 1261.4 1265.3 1269.4 1273.7	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3 1237.9 1232.3 1228.8 1227.9	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2 1257.2 1260.5 1264.1 1268.0 1272.3	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1 1310.9 1333.4 1353.9 1369.3	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06 0.11 0.14 0.17 0.17	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00 -0.01 -0.02 -0.03 -0.04 -0.05	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00 -1.89 -2.64 -3.24 -3.64	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 %JUN 0.00 -0.05 -0.10 -0.13 -0.15 -0.16	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17 3.90 5.34 6.61 7.45	0.0203 0.0387 0.0548 0.0677 0.0765 0.0793 0.0636 0.0393 0.0000 α 0.0000 0.0203 0.0000 0.0203 0.0389 0.0550 0.0680 0.0769
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \hline X_1\\ 0.0000\\ 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9 1261.7 1265.7 1265.7 1269.9 1274.3 1278.8	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7 1263.1 1267.6 1272.0 1276.5 1281.0	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8 1261.4 1265.3 1269.4 1273.7 1278.2	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3 1237.9 1232.3 1228.8 1227.9 1230.3	1280.0 1282.8 1285.8 1285.8 1299.1 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2 1257.2 1260.5 1264.1 1268.0 1272.3 1276.9	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1 1310.9 1333.4 1353.9 1369.3 1378.1	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06 0.11 0.14 0.17 0.17	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00 -0.01 -0.02 -0.03 -0.04 -0.05 -0.05	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00 -1.89 -2.64 -3.24 -3.64 -3.79	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 %JUN 0.00 -0.05 -0.10 -0.13 -0.15 -0.16 -0.15	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17 3.90 5.34 6.61 7.45 7.76	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393 0.0000 α 0.0000 0.0203 0.0000 0.0203 0.0389 0.0550 0.0680 0.0769 0.0804
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \hline X_1\\ 0.0000\\ 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9 1261.7 1265.7 1265.7 1269.9 1274.3 1278.8 1283.6	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7 1263.1 1267.6 1272.0 1276.5 1281.0 1285.5	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8 1261.4 1265.3 1269.4 1273.7 1278.2 1282.9	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3 1237.9 1232.3 1228.8 1227.9 1230.3 1237.0	1280.0 1282.8 1285.8 1285.8 1292.8 1292.8 1292.8 1292.8 1292.8 1292.8 1292.8 1305.7 1310.7 1310.7 1316.0 JUN 1254.2 1257.2 1260.5 1264.1 1268.0 1272.3 1276.9 1281.9	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1 1310.9 1333.4 1353.9 1369.3 1378.1 1378.0	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06 0.11 0.14 0.17 0.17 0.17 0.14	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00 -0.01 -0.02 -0.03 -0.04 -0.05 -0.05 -0.05	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00 -1.89 -2.64 -3.24 -3.64 -3.79 -3.64	-0.08 -0.14 -0.19 -0.22 -0.23 -0.21 -0.17 -0.10 0.00 %JUN 0.00 -0.05 -0.10 -0.13 -0.15 -0.16 -0.15 -0.14	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17 3.90 5.34 6.61 7.45 7.76 7.35	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393 0.0000 α 0.0000 α 0.0000 0.0203 0.0389 0.0550 0.0680 0.0769 0.0804 0.0769
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \hline X_1\\ 0.0000\\ 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9 1261.7 1265.7 1265.7 1265.7 1269.9 1274.3 1278.8 1283.6 1288.6	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7 1263.1 1267.6 1272.0 1276.5 1281.0 1285.5 1290.0	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8 1261.4 1265.3 1269.4 1273.7 1278.2 1282.9 1288.0	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3 1237.9 1232.3 1228.8 1227.9 1230.3 1237.0 1249.1	1280.0 1282.8 1285.8 1285.8 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2 1257.2 1260.5 1264.1 1268.0 1272.3 1276.9 1281.9 1287.2	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1 1310.9 1333.4 1353.9 1369.3 1378.1 1378.0 1366.7	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06 0.11 0.14 0.17 0.17 0.17 0.14 0.11	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 % IMP 0.00 -0.01 -0.02 -0.03 -0.04 -0.05 -0.05 -0.05 -0.04	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00 -1.89 -2.64 -3.24 -3.64 -3.79 -3.64 -3.06	-0.08 -0.14 -0.19 -0.22 -0.23 -0.23 -0.21 -0.17 -0.10 0.00 %JUN 0.00 -0.05 -0.10 -0.13 -0.15 -0.16 -0.15 -0.14 -0.11	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17 3.90 5.34 6.61 7.45 7.76 7.35 6.07	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393 0.0000 α 0.0000 0.0203 0.0000 0.0203 0.0389 0.0550 0.0680 0.0769 0.0804 0.0769 0.0804
$\begin{array}{c} 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ 1.0000\\ \hline X_1\\ 0.0000\\ 0.0701\\ 0.1450\\ 0.2252\\ 0.3113\\ 0.4041\\ 0.5043\\ 0.6128\\ 0.7307\\ 0.8592\\ \end{array}$	1277.6 1281.0 1284.5 1288.2 1292.0 1295.8 1303.8 1307.9 1312.0 1316.0 EXP 1254.2 1257.9 1261.7 1265.7 1265.7 1269.9 1274.3 1278.8 1283.6 1288.6 1293.7	1277.6 1281.4 1285.2 1289.0 1292.9 1296.7 1300.5 1304.4 1308.3 1312.1 1316.0 NOM 1254.2 1258.7 1263.1 1267.6 1272.0 1276.5 1281.0 1285.5 1290.0 1294.5	1277.6 1280.6 1283.8 1287.1 1290.6 1294.3 1298.1 1302.2 1306.6 1311.1 1316.0 IMP 1254.2 1257.8 1261.4 1265.3 1269.4 1273.7 1278.2 1282.9 1288.0 1293.3	1268.2 1260.4 1254.3 1250.3 1248.9 1250.8 1256.8 1268.2 1286.9 1316.0 VDV 1254.2 1245.3 1237.9 1232.3 1228.8 1227.9 1230.3 1237.0 1249.1 1268.7	1280.0 1282.8 1285.8 1285.8 1292.8 1296.7 1301.0 1305.7 1310.7 1316.0 JUN 1254.2 1257.2 1260.5 1264.1 1268.0 1272.3 1276.9 1281.9 1287.2 1292.9	1306.8 1331.3 1352.8 1370.5 1384.7 1392.5 1391.9 1380.9 1356.5 1316.0 AT 318.1 RAO 1254.2 1285.1 1310.9 1333.4 1353.9 1369.3 1378.1 1378.0 1366.7 1341.4	0.03 0.05 0.07 0.07 0.06 0.05 0.03 0.01 0.00 5K %NOM 0.00 0.06 0.11 0.14 0.17 0.17 0.17 0.17 0.14 0.11 0.06	-0.03 -0.06 -0.08 -0.11 -0.12 -0.13 -0.12 -0.10 -0.06 0.00 -0.01 -0.02 -0.03 -0.04 -0.05 -0.05 -0.05 -0.04 -0.03	-1.00 -1.88 -2.63 -3.22 -3.62 -3.77 -3.61 -3.04 -1.91 0.00 %VDV 0.00 -1.00 -1.89 -2.64 -3.24 -3.64 -3.79 -3.64 -3.06 -1.93	-0.08 -0.14 -0.19 -0.22 -0.23 -0.21 -0.17 -0.10 0.00 %JUN 0.00 -0.05 -0.10 -0.13 -0.15 -0.16 -0.15 -0.14 -0.11 -0.06	2.01 3.64 5.02 6.08 6.86 7.14 6.76 5.58 3.39 0.00 %RAO 0.00 2.17 3.90 5.34 6.61 7.45 7.76 7.35 6.07 3.69	0.0203 0.0387 0.0548 0.0677 0.0765 0.0799 0.0763 0.0636 0.0393 0.0000 α 0.0000 0.0203 0.0000 0.0203 0.0389 0.0550 0.0680 0.0769 0.0804 0.0769 0.0804 0.0769 0.0804 0.0769

						TABLE-	3					
EXPERI	MENTAL A	AND THEC	DRETICAL	VALUES	OF VELOC	CITIES WIT	TH THEIR 9	6 DEVIAT	TIONS FOR	THE SYS	TEM (EB +	BOE)
						AT 303.1	5K					
$X_1$	EXP	NOM	IMP	VDV	JUN	RAO	%NOM	%IMP	%VDV	%JUN	%RAO	α
0.0000	1290.2	1290.2	1290.2	1290.2	1290.2	1290.2	0.00	0.00	0.00	0.00	0.00	0.0000
0.0923	1295.5	1295.7	1296.1	1291.0	1293.5	1310.1	0.02	0.05	-0.35	-0.16	1.13	0.0070
0.1863	1300.4	1301.3	1302.0	1292.7	1297.2	1327.7	0.07	0.12	-0.60	-0.24	2.10	0.0120
0.2818	1305.5	1306.8	1307.8	1295.2	1301.5	1342.4	0.10	0.17	-0.79	-0.31	2.83	0.0159
0.3790	1310.5	1312.4	1313.5	1298.8	1306.2	1354.1	0.15	0.23	-0.89	-0.33	3.33	0.0181
0.4780	1315.9	1318.0	1319.1	1303.4	1311.4	1362.5	0.16	0.24	-0.95	-0.34	3.54	0.0192
0.5787	1321.7	1323.6	1324.6	1309.2	1317.2	1367.5	0.14	0.22	-0.94	-0.34	3.46	0.0191
0.6812	1327.6	1329.2	1330.1	1316.3	1323.6	1368.5	0.12	0.19	-0.85	-0.30	3.08	0.0173
0.7855	1333.8	1334.9	1335.6	1324.7	1330.5	1365.4	0.08	0.13	-0.69	-0.25	2.37	0.0138
0.8918	1340.0	1340.5	1340.9	1334.6	1338.0	1358.1	0.04	0.07	-0.40	-0.15	1.35	0.0081
1.0000	1346.2	1346.2	1346.2	1346.2	1346.2	1346.2	0.00	0.00	0.00	0.00	0.00	0.0000
AT 308.15K												
$X_1$	EXP	NOM	IMP	VDV	JUN	RAO	%NOM	%IMP	%VDV	%JUN	%RAO	α
0.0000	1254.4	1254.4	1254.4	1254.4	1254.4	1254.4	0.00	0.00	0.00	0.00	0.00	0.0000
0.0923	1260.8	1262.0	1262.6	1256.7	1259.3	1276.5	0.10	0.14	-0.33	-0.12	1 24	0.0066
0.1863	1267.4	1269.6	1202.0	1259.9	1264.7	1296.2	0.18	0.26	-0.59	-0.21	2 27	0.0120
0.2818	1274.4	1202.0	1278.7	1264.1	1270.8	1313.1	0.23	0.20	-0.81	-0.28	3.04	0.0120
0.3790	1281.6	1285.0	1286.6	1269.5	1277.4	1327.0	0.23	0.39	-0.95	-0.33	3 54	0.0192
0.4780	1289.0	1203.0	1200.0	1276.0	1284 7	1337.7	0.29	0.42	-1.01	-0.33	3 78	0.0204
0.5787	1205.0	1300.5	1302.1	1283.9	1292.7	1344.8	0.29	0.40	-1.00	-0.33	3.70	0.0203
0.6812	1305.3	1308.3	1302.1	1203.3	1301.3	1348.0	0.23	0.34	-0.92	-0.31	3.70	0.0187
0.7855	1313.9	1316.1	1317.2	1203.3	1310.7	1347.1	0.17	0.25	-0.73	-0.24	2.53	0.0107
0.8018	1322.0	1324.0	1324.6	1317.0	1320.0	13/18	0.08	0.13	-0.44	-0.15	1.43	0.0140
1 0000	1322.9	1324.0	1324.0	1331.0	1320.7	1331.0	0.00	0.15	0.00	-0.15	0.00	0.0000
1.(//////	1551.7	1551.7	1551.7	1551.7	1551.7	1551.7	0.00	0.00	0.00	0.00	0.00	0.0000
						AT 313 1	5K					
v	EVD	NOM	MD	VDV	ILIN	AT 313.1	5K %NOM	0/ <b>IMD</b>		0/ 11 IN	0/ PAO	α
X <sub>1</sub>	EXP	NOM	IMP	VDV	JUN	AT 313.1 RAO	5K %NOM	%IMP	%VDV	%JUN	%RAO	α
X <sub>1</sub> 0.0000	EXP 1249.3	NOM 1249.3	IMP 1249.3	VDV 1249.3	JUN 1249.3	AT 313.1 RAO 1249.3	5K %NOM 0.00	%IMP 0.00	%VDV 0.00	%JUN 0.00	%RAO 0.00	α 0.0000
X <sub>1</sub> 0.0000 0.0923	EXP 1249.3 1254.1	NOM 1249.3 1255.8	IMP 1249.3 1256.4	VDV 1249.3 1250.9	JUN 1249.3 1253.3	AT 313.1 RAO 1249.3 1271.4	5K %NOM 0.00 0.14	%IMP 0.00 0.18	%VDV 0.00 -0.26	%JUN 0.00 -0.06	%RAO 0.00 1.38 2.40	α 0.0000 0.0052
X <sub>1</sub> 0.0000 0.0923 0.1863	EXP 1249.3 1254.1 1259.6	NOM 1249.3 1255.8 1262.4	IMP 1249.3 1256.4 1263.3	VDV 1249.3 1250.9 1253.3	JUN 1249.3 1253.3 1257.9	AT 313.1 RAO 1249.3 1271.4 1291.0	5K %NOM 0.00 0.14 0.22	%IMP 0.00 0.18 0.30	%VDV 0.00 -0.26 -0.50	%JUN 0.00 -0.06 -0.13	%RAO 0.00 1.38 2.49	α 0.0000 0.0052 0.0100
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818	EXP 1249.3 1254.1 1259.6 1265.5	NOM 1249.3 1255.8 1262.4 1269.0	IMP 1249.3 1256.4 1263.3 1270.2	VDV 1249.3 1250.9 1253.3 1256.8	JUN 1249.3 1253.3 1257.9 1263.0	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5	5K %NOM 0.00 0.14 0.22 0.28	%IMP 0.00 0.18 0.30 0.37	%VDV 0.00 -0.26 -0.50 -0.69	%JUN 0.00 -0.06 -0.13 -0.19	%RAO 0.00 1.38 2.49 3.32	α 0.0000 0.0052 0.0100 0.0139
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790	EXP 1249.3 1254.1 1259.6 1265.5 1271.5	NOM 1249.3 1255.8 1262.4 1269.0 1275.7	IMP 1249.3 1256.4 1263.3 1270.2 1277.0	VDV 1249.3 1250.9 1253.3 1256.8 1261.3	JUN 1249.3 1253.3 1257.9 1263.0 1268.7	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.25	%IMP 0.00 0.18 0.30 0.37 0.43	%VDV 0.00 -0.26 -0.50 -0.69 -0.80	%JUN 0.00 -0.06 -0.13 -0.19 -0.22	%RAO 0.00 1.38 2.49 3.32 3.88	α 0.0000 0.0052 0.0100 0.0139 0.0163
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.21	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86	%JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23	%RAO 0.00 1.38 2.49 3.32 3.88 4.12	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780 0.5787 0.6012	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1201.6	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1205.7	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1290.4	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 0.75	%JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 0.17	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780 0.5787 0.6812 0.5755	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.75	%JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.17	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.00	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780 0.5787 0.6812 0.7855 0.2019	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1200.2	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1200.7	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.75 -0.59	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 0.10	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780 0.5787 0.6812 0.7855 0.8918	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.20	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.59 -0.37	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780 0.5787 0.6812 0.7855 0.8918 1.0000	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.59 -0.37 0.00	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780 0.5787 0.6812 0.7855 0.8918 1.0000	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.59 -0.37 0.00	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780 0.5787 0.6812 0.7855 0.8918 1.0000 X <sub>1</sub>	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0 EXP	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.59 -0.37 0.00 %VDV	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 % JUN	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 α
X <sub>1</sub> 0.0000 0.0923 0.1863 0.2818 0.3790 0.4780 0.5787 0.6812 0.7855 0.8918 1.0000 X <sub>1</sub> 0.0000	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0 EXP 1238.2	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 % JUN 0.00	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 α
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ X_1 \\ 0.0000 \\ 0.0923 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 % JUN 0.00 -0.03	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 α 0.0000 0.0045
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2 1247.0	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2 1250.2	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6 1251.0	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4 1241.5	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8 1246.0	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8 1280.6	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16 0.26	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20 0.32	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22 -0.44	%JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 %JUN 0.00 -0.03 -0.08	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50 2.69	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 α 0.0000 0.0045 0.0009
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2 1242.2 1247.0 1252.2	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2 1250.2 1256.2	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6 1251.0 1257.3	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4 1241.5 1244.5	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8 1246.0 1250.6	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8 1280.6 1297.2	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16 0.26 0.32	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20 0.32 0.41	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22 -0.44 -0.61	%JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 %JUN 0.00 -0.03 -0.08 -0.13	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50 2.69 3.59	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 α 0.0000 0.0045 0.0089 0.0124
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2 1247.0 1252.2 1257.6	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2 1250.2 1256.2 1262.3	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6 1251.0 1257.3 1263.5	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4 1241.5 1244.5 1248.5	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8 1246.0 1250.6 1255.7	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8 1280.6 1297.2 1310.3	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16 0.26 0.32 0.37	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20 0.32 0.41 0.47	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22 -0.44 -0.61 -0.72	%JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 %JUN 0.00 -0.03 -0.08 -0.13 -0.15	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50 2.69 3.59 4.19	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 α 0.0000 0.0045 0.0089 0.0124 0.0146
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2 1247.0 1252.2 1257.6 1263.4	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2 1250.2 1256.2 1262.3 1268.3	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6 1251.0 1257.3 1263.5 1269.6	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4 1241.5 1244.5 1248.5 1253.6	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8 1246.0 1250.6 1255.7 1261.4	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8 1280.6 1297.2 1310.3 1319.7	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16 0.26 0.32 0.37 0.39	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20 0.32 0.41 0.47 0.49	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22 -0.44 -0.61 -0.72 -0.77	%JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 %JUN 0.00 -0.03 -0.08 -0.13 -0.15 -0.15	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50 2.69 3.59 4.19 4.46	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 α 0.0000 0.0045 0.0089 0.0124 0.0157
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1291.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2 1247.0 1252.2 1257.6 1263.4 1269.4	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2 1250.2 1256.2 1262.3 1268.3 1274.4	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6 1251.0 1257.3 1263.5 1269.6 1275.6	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4 1241.5 1244.5 1248.5 1253.6 1259.9	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8 1246.0 1250.6 1255.7 1261.4 1267.7	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8 1280.6 1297.2 1310.3 1319.7 1325.0	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16 0.26 0.32 0.37 0.39 0.40	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20 0.32 0.41 0.47 0.49 0.49	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.86 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22 -0.44 -0.61 -0.72 -0.77 -0.75	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 % JUN 0.00 -0.03 -0.08 -0.13 -0.15 -0.15 -0.13	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50 2.69 3.59 4.19 4.46 4.38	α 0.0000 0.0052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 0.0000 0.0005 0.0000 0.0045 0.0089 0.0124 0.0157 0.0152
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ \hline X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2 1247.0 1252.2 1257.6 1263.4 1269.4 1275.8	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2 1250.2 1256.2 1262.3 1268.3 1274.4 1280.5	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6 1251.0 1257.3 1263.5 1269.6 1275.6 1281.6	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4 1241.5 1244.5 1244.5 1248.5 1253.6 1259.9 1267.4	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8 1246.0 1250.6 1255.7 1261.4 1267.7 1274.6	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8 1280.6 1297.2 1310.3 1319.7 1325.0 1325.8	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16 0.26 0.32 0.37 0.39 0.40 0.37	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20 0.32 0.41 0.47 0.49 0.49 0.45	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22 -0.44 -0.61 -0.72 -0.77 -0.75 -0.66	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 % JUN 0.00 -0.03 -0.08 -0.13 -0.15 -0.15 -0.13 -0.10	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50 2.69 3.59 4.19 4.46 4.38 3.92	<ul> <li>α</li> <li>0.0000</li> <li>0.0052</li> <li>0.0100</li> <li>0.0139</li> <li>0.0163</li> <li>0.0175</li> <li>0.0172</li> <li>0.0152</li> <li>0.0119</li> <li>0.0075</li> <li>0.0000</li> <li>α</li> <li>0.0000</li> <li>0.0045</li> <li>0.0089</li> <li>0.0124</li> <li>0.0146</li> <li>0.0157</li> <li>0.0152</li> <li>0.0152</li> <li>0.0152</li> <li>0.0152</li> <li>0.0152</li> <li>0.0152</li> <li>0.0133</li> </ul>
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2 1247.0 1252.2 1257.6 1263.4 1269.4 1275.8 1282.7	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2 1250.2 1256.2 1262.3 1268.3 1274.4 1280.5 1286.7	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6 1251.0 1257.3 1263.5 1269.6 1275.6 1281.6 1287.5	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4 1241.5 1244.5 1244.5 1244.5 1248.5 1253.6 1259.9 1267.4 1276.3	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8 1246.0 1250.6 1255.7 1261.4 1267.7 1274.6 1282.1	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8 1280.6 1297.2 1310.3 1319.7 1325.0 1325.8 1321.9	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16 0.26 0.32 0.37 0.39 0.40 0.37 0.31	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20 0.32 0.41 0.47 0.49 0.49 0.45 0.37	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22 -0.44 -0.61 -0.72 -0.77 -0.75 -0.66 -0.50	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 % JUN 0.00 -0.03 -0.08 -0.13 -0.15 -0.15 -0.15 -0.13 -0.10 -0.05	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50 2.69 3.59 4.19 4.46 4.38 3.92 3.05	α 0.0000 0.052 0.0100 0.0139 0.0163 0.0175 0.0172 0.0152 0.0119 0.0075 0.0000 α 0.0000 0.0045 0.0089 0.0124 0.0157 0.0152 0.0124 0.0157 0.0152 0.0154 0.0157 0.0152 0.0124 0.0157 0.0152 0.0124 0.0157 0.0152 0.0124 0.0157 0.0152 0.0124 0.0157 0.0152 0.0157 0.0157 0.0152 0.0100 0.0000 0.0055 0.0005 0.0055 0.0005 0.0055 0.0055 0.0005 0.0055
$\begin{array}{c} X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \\ 1.0000 \\ X_1 \\ 0.0000 \\ 0.0923 \\ 0.1863 \\ 0.2818 \\ 0.3790 \\ 0.4780 \\ 0.5787 \\ 0.6812 \\ 0.7855 \\ 0.8918 \end{array}$	EXP 1249.3 1254.1 1259.6 1265.5 1271.5 1277.9 1284.6 1299.2 1307.7 1316.0 EXP 1238.2 1242.2 1247.0 1252.2 1257.6 1263.4 1269.4 1275.8 1282.7 1290.3	NOM 1249.3 1255.8 1262.4 1269.0 1275.7 1282.3 1289.0 1295.7 1302.4 1309.2 1316.0 NOM 1238.2 1244.2 1250.2 1256.2 1262.3 1268.3 1274.4 1280.5 1286.7 1292.8	IMP 1249.3 1256.4 1263.3 1270.2 1277.0 1283.7 1290.4 1296.9 1303.3 1309.7 1316.0 IMP 1238.2 1244.6 1251.0 1257.3 1263.5 1269.6 1275.6 1281.6 1287.5 1293.3	VDV 1249.3 1250.9 1253.3 1256.8 1261.3 1266.9 1273.7 1281.9 1291.5 1302.8 1316.0 VDV 1238.2 1239.4 1241.5 1244.5 1248.5 1253.6 1259.9 1267.4 1276.3 1286.8	JUN 1249.3 1253.3 1257.9 1263.0 1268.7 1275.0 1281.9 1289.4 1297.5 1306.4 1316.0 JUN 1238.2 1241.8 1246.0 1250.6 1255.7 1261.4 1267.7 1274.6 1282.1 1290.2	AT 313.1 RAO 1249.3 1271.4 1291.0 1307.5 1320.8 1330.6 1336.6 1338.3 1335.6 1328.2 1316.0 AT 318.1 RAO 1238.2 1260.8 1280.6 1297.2 1310.3 1319.7 1325.0 1325.8 1321.9 1313.0	5K %NOM 0.00 0.14 0.22 0.28 0.33 0.35 0.34 0.32 0.25 0.12 0.00 5K %NOM 0.00 0.16 0.26 0.32 0.37 0.39 0.40 0.37 0.31 0.20	% IMP 0.00 0.18 0.30 0.37 0.43 0.46 0.45 0.41 0.32 0.15 0.00 % IMP 0.00 0.20 0.32 0.41 0.47 0.49 0.49 0.49 0.45 0.37 0.23	%VDV 0.00 -0.26 -0.50 -0.69 -0.80 -0.85 -0.75 -0.59 -0.37 0.00 %VDV 0.00 -0.22 -0.44 -0.61 -0.72 -0.77 -0.75 -0.66 -0.50 -0.50 -0.27	% JUN 0.00 -0.06 -0.13 -0.19 -0.22 -0.23 -0.21 -0.17 -0.13 -0.10 0.00 % JUN 0.00 -0.03 -0.08 -0.13 -0.15 -0.15 -0.15 -0.13 -0.10 -0.05 -0.01	%RAO 0.00 1.38 2.49 3.32 3.88 4.12 4.05 3.61 2.80 1.57 0.00 %RAO 0.00 1.50 2.69 3.59 4.19 4.46 4.38 3.92 3.05 1.76	α           0.0000           0.0052           0.0100           0.0139           0.0175           0.0172           0.0152           0.0175           0.0075           0.0000           α           0.0000           0.0000           0.00045           0.00089           0.0124           0.0146           0.0152           0.0133           0.0101

#### TABLE-4 VALUES OF CHI-SQUARE AND SIGMA RELATIVE DEVIATION FOR ALL THE BINARY MIXTURES OF EB AT DIFFERENT TEMPERATURES SYSTEM-I (EB+MOE)

			DIDIEM	I (LD   MO	L)					
	$\chi^2$				SdU					
NOM	IMP	VDV	JUN	RAO	NOM	IMP	VDV	JUN	RAO	
0.012	0.078	26.106	0.047	32.771	-0.008	-0.022	-0.416	-0.017	0.423	
0.011	0.057	24.948	0.042	41.623	-0.008	-0.019	-0.409	-0.016	0.477	
0.001	0.041	25.133	0.016	48.943	0.001	-0.016	-0.414	-0.010	0.517	
0.004	0.036	23.841	0.024	55.281	-0.004	-0.015	-0.404	-0.012	0.549	
				SYSTEM-	-II (EB+EOE)					
	$\chi^2$				SdU					
NOM	IMP	VDV	JUN	RAO	NOM	IMP	VDV	JUN	RAO	
0.003	0.045	10.700	0.093	24.640	-0.004	-0.016	-0.264	-0.024	0.370	
0.001	0.021	10.291	0.053	29.283	0.002	-0.011	-0.260	-0.018	0.405	
0.003	0.011	9.747	0.039	34.492	0.004	-0.008	-0.255	-0.016	0.440	
0.020	0.002	9.705	0.017	39.895	0.011	-0.003	-0.256	-0.010	0.474	
				SYSTEM-	III (EB+BOE)					
	$\chi^2$				SdU					
NOM	IMP	VDV	JUN	RAO	NOM	IMP	VDV	JUN	RAO	
0.014	0.035	0.663	0.091	8.726	0.009	0.014	-0.065	-0.024	0.226	
0.053	0.114	0.724	0.082	9.752	0.018	0.027	-0.068	-0.023	0.241	
0.085	0.147	0.505	0.033	11.630	0.023	0.031	-0.057	-0.015	0.263	
0.115	0.177	0.387	0.013	13.505	0.028	0.034	-0.050	-0.008	0.285	
	NOM 0.012 0.011 0.001 0.004 NOM 0.003 0.001 0.003 0.020 NOM 0.014 0.053 0.085 0.115	$\begin{array}{cccc} & \chi^2 \\ \text{NOM} & \text{IMP} \\ 0.012 & 0.078 \\ 0.011 & 0.057 \\ 0.001 & 0.041 \\ 0.004 & 0.036 \\ \end{array}$ $\begin{array}{c} & \chi^2 \\ \text{NOM} & \text{IMP} \\ 0.003 & 0.045 \\ 0.001 & 0.021 \\ 0.003 & 0.011 \\ 0.020 & 0.002 \\ \end{array}$ $\begin{array}{c} & \chi^2 \\ \text{NOM} & \text{IMP} \\ 0.014 & 0.035 \\ 0.053 & 0.114 \\ 0.085 & 0.147 \\ 0.115 & 0.177 \\ \end{array}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\chi^2$ JUN           NOM         IMP         VDV         JUN           0.012         0.078         26.106         0.047           0.011         0.057         24.948         0.042           0.001         0.041         25.133         0.016           0.004         0.036         23.841         0.024 $\chi^2$ NOM         IMP         VDV         JUN           0.003         0.045         10.700         0.093           0.001         0.021         10.291         0.053           0.003         0.011         9.747         0.039           0.020         0.002         9.705         0.017 $\chi^2$ NOM         IMP         VDV         JUN           0.014         0.035         0.663         0.091           0.013         0.114         0.724         0.082           0.085         0.147         0.505         0.033           0.115         0.177         0.387         0.013	$\chi^2$ JUNRAO0.0120.07826.1060.04732.7710.0110.05724.9480.04241.6230.0010.04125.1330.01648.9430.0040.03623.8410.02455.281SYSTEM- $\chi^2$ SYSTEM- </td <td><math>\chi^2</math>         SdU           NOM         IMP         VDV         JUN         RAO         NOM           0.012         0.078         26.106         0.047         32.771         -0.008           0.011         0.057         24.948         0.042         41.623         -0.008           0.001         0.041         25.133         0.016         48.943         0.001           0.004         0.036         23.841         0.024         55.281         -0.004           SYSTEM-II (EB+EO         <math>\chi^2</math>         SdU         NOM         0.003         0.045         10.700         0.093         24.640         -0.004           0.003         0.045         10.700         0.093         24.640         -0.004           0.001         0.021         10.291         0.053         29.283         0.002           0.003         0.011         9.747         0.039         34.492         0.004           0.020         0.002         9.705         0.017         39.895         0.011           0.021         0.35         0.663         0.091         8.726         0.009           0.053         0.114         0.724         0.082         9.752         0.018</td> <td>STOTEM I(EDTRICE)<math>\chi^2</math>SdUNOMIMPVDVJUNRAONOMIMP0.0120.07826.1060.04732.771-0.008-0.0220.0110.05724.9480.04241.623-0.008-0.0190.0010.04125.1330.01648.9430.001-0.0160.0040.03623.8410.02455.281-0.004-0.015SYSTEM-II (EB+EOE)<math>\chi^2</math>SdUNOMIMP0.0030.04510.7000.09324.640-0.004-0.0160.0010.02110.2910.05329.2830.002-0.0110.0030.0119.7470.03934.4920.004-0.0080.0200.0029.7050.01739.8950.011-0.003SYSTEM-III (EB+BOE)<math>\chi^2</math>SdUNOMIMPVDVJUNRAONOMIMP0.0140.0350.6630.0918.7260.0090.0140.0530.1140.7240.0829.7520.0180.0270.0850.1470.5050.03311.6300.0230.0310.1150.1770.3870.01313.5050.0280.034</td> <td><math>\chi^2</math>SdUNOMIMPVDVJUNRAONOMIMPVDV0.0120.07826.1060.04732.771-0.008-0.022-0.4160.0110.05724.9480.04241.623-0.008-0.019-0.4090.0010.04125.1330.01648.9430.001-0.016-0.4140.0040.03623.8410.02455.281-0.004-0.015-0.404SYSTEM-II (EB+EOE)<math>\chi^2</math>SdUNOMNOMIMPVDVJUNRAONOMIMPVDV0.0030.04510.7000.09324.640-0.004-0.016-0.2640.0010.02110.2910.05329.2830.002-0.011-0.2600.0030.0119.7470.03934.4920.004-0.008-0.2550.0200.0029.7050.01739.8950.011-0.003-0.256SYSTEM-III (EB+BOE)<math>\chi^2</math>SdUNOMIMPVDVJUNRAONOMIMPVDV0.0140.0350.6630.0918.7260.0090.014-0.0650.0530.1140.7240.0829.7520.0180.027-0.0680.0850.1470.5050.03311.6300.0230.031-0.0570.1150.1770.3870.</td> <td><math>\chi^2</math>SdUNOMIMPVDVJUNRAONOMIMPVDVJUN0.0120.07826.1060.04732.771-0.008-0.022-0.416-0.0170.0110.05724.9480.04241.623-0.008-0.019-0.409-0.0160.0010.04125.1330.01648.9430.001-0.016-0.414-0.0100.0040.03623.8410.02455.281-0.004-0.015-0.404-0.012xYSTEM-II (EB+EOE)<math>\chi^2</math>SdUNOMIMPVDVJUN0.0030.04510.7000.09324.640-0.016-0.264-0.0240.0010.02110.2910.05329.2830.002-0.011-0.260-0.0180.0030.0119.7470.03934.4920.004-0.008-0.255-0.0160.0200.0029.7050.01739.8950.011-0.003-0.256-0.010StUX²SdUNOMIMPVDVJUNRAONOMIMPVDVJUN0.0140.0350.6630.0918.7260.0090.014-0.065-0.0240.0350.6630.0918.7260.0180.027-0.068-0.0230.0530.1140.7240.0829.7520.0180.</td>	$\chi^2$ SdU           NOM         IMP         VDV         JUN         RAO         NOM           0.012         0.078         26.106         0.047         32.771         -0.008           0.011         0.057         24.948         0.042         41.623         -0.008           0.001         0.041         25.133         0.016         48.943         0.001           0.004         0.036         23.841         0.024         55.281         -0.004           SYSTEM-II (EB+EO $\chi^2$ SdU         NOM         0.003         0.045         10.700         0.093         24.640         -0.004           0.003         0.045         10.700         0.093         24.640         -0.004           0.001         0.021         10.291         0.053         29.283         0.002           0.003         0.011         9.747         0.039         34.492         0.004           0.020         0.002         9.705         0.017         39.895         0.011           0.021         0.35         0.663         0.091         8.726         0.009           0.053         0.114         0.724         0.082         9.752         0.018	STOTEM I(EDTRICE) $\chi^2$ SdUNOMIMPVDVJUNRAONOMIMP0.0120.07826.1060.04732.771-0.008-0.0220.0110.05724.9480.04241.623-0.008-0.0190.0010.04125.1330.01648.9430.001-0.0160.0040.03623.8410.02455.281-0.004-0.015SYSTEM-II (EB+EOE) $\chi^2$ SdUNOMIMP0.0030.04510.7000.09324.640-0.004-0.0160.0010.02110.2910.05329.2830.002-0.0110.0030.0119.7470.03934.4920.004-0.0080.0200.0029.7050.01739.8950.011-0.003SYSTEM-III (EB+BOE) $\chi^2$ SdUNOMIMPVDVJUNRAONOMIMP0.0140.0350.6630.0918.7260.0090.0140.0530.1140.7240.0829.7520.0180.0270.0850.1470.5050.03311.6300.0230.0310.1150.1770.3870.01313.5050.0280.034	$\chi^2$ SdUNOMIMPVDVJUNRAONOMIMPVDV0.0120.07826.1060.04732.771-0.008-0.022-0.4160.0110.05724.9480.04241.623-0.008-0.019-0.4090.0010.04125.1330.01648.9430.001-0.016-0.4140.0040.03623.8410.02455.281-0.004-0.015-0.404SYSTEM-II (EB+EOE) $\chi^2$ SdUNOMNOMIMPVDVJUNRAONOMIMPVDV0.0030.04510.7000.09324.640-0.004-0.016-0.2640.0010.02110.2910.05329.2830.002-0.011-0.2600.0030.0119.7470.03934.4920.004-0.008-0.2550.0200.0029.7050.01739.8950.011-0.003-0.256SYSTEM-III (EB+BOE) $\chi^2$ SdUNOMIMPVDVJUNRAONOMIMPVDV0.0140.0350.6630.0918.7260.0090.014-0.0650.0530.1140.7240.0829.7520.0180.027-0.0680.0850.1470.5050.03311.6300.0230.031-0.0570.1150.1770.3870.	$\chi^2$ SdUNOMIMPVDVJUNRAONOMIMPVDVJUN0.0120.07826.1060.04732.771-0.008-0.022-0.416-0.0170.0110.05724.9480.04241.623-0.008-0.019-0.409-0.0160.0010.04125.1330.01648.9430.001-0.016-0.414-0.0100.0040.03623.8410.02455.281-0.004-0.015-0.404-0.012xYSTEM-II (EB+EOE) $\chi^2$ SdUNOMIMPVDVJUN0.0030.04510.7000.09324.640-0.016-0.264-0.0240.0010.02110.2910.05329.2830.002-0.011-0.260-0.0180.0030.0119.7470.03934.4920.004-0.008-0.255-0.0160.0200.0029.7050.01739.8950.011-0.003-0.256-0.010StUX²SdUNOMIMPVDVJUNRAONOMIMPVDVJUN0.0140.0350.6630.0918.7260.0090.014-0.065-0.0240.0350.6630.0918.7260.0180.027-0.068-0.0230.0530.1140.7240.0829.7520.0180.	







The data reveals that the velocities computed from Nomoto's relation (NOM) and Impedance relation (IMP) and Junjie's relation (JUN) exhibit more satisfactory agreement with the experimental values in the temperature range 303.15K - 318.15K than other approaches in the binary systems. It is observed that the experimental values show deviation with the theoretical values of ultrasonic velocities which confirms the existence of molecular interactions [35-38]. This may be due to interactions occurring between the hetero molecules of the binaries. Higher deviations are observed in Van Dael and Vangeel and Rao's specific velocity methods. There are higher variations in some intermediate concentration range suggesting the existence of strong tendency of association between component molecules as a result of dipole-dipole interactions. However, there is reasonably a good agreement between the experimental and theoretical velocities of Nomoto's relation Impedance relation and Junjie's relation. Nomoto's theory proposes that the volume does not change upon mixing of solvents. Therefore, no interaction between the components of liquid mixtures has been taken into account. Similarly, the assumption for the formation of ideal mixing relation is that the ratios of specific heats of ideal mixtures and the volumes are also equal. Again no molecular interactions are taken into account. But upon mixing, interactions between the molecules occur because of the presence of various types of forces such as dispersion forces, charge transfer, hydrogen bonding dipole-dipole and dipole-induced dipole interactions. Thus, the observed deviation of theoretical values of velocity from the experimental values shows that the molecular interactions are taking place between the unlike molecules in the liquid mixtures. From all the Tables, it is observed that maximum positive deviation exhibiting a minimum of approximately 0.5 mole fraction for all the three systems at all the temperatures. The ratio  $U_{exp}^2/U_{imx}^2$  is an important tool to measure the non ideality in the mixtures especially in such cases where the properties other than sound velocity are not known.

Figures a, b and **c** represent the variation of  $U^2_{exp}/U^2_{imx}$  with the mole fraction of ethyl benzoate for all three binary systems studied and the ratio of  $U^2_{exp}/U^2_{imx}$  gives an idea of extent of interaction taking place between molecules of the mixtures. The positive deviation for the systems infers strong interactions between the components. The percentage of deviation in velocity is reflecting both negative and positive magnitudes indicating non ideal behaviour of liquid mixtures. The evaluated interaction parameters are positive for all the systems, indicating strong interactions between the mixing molecules. The negative values of interaction parameter indicate the dominance of dispersion forces arising from the breakage of hydrogen bonds in the associates. But a positive value of ( $\alpha$ ) in all the system clearly indicates the existence of strong tendency for the formation of association in mixture through strong dipole-dipole / dipole-induced dipole interactions, hydrogen bonding interactions and higher values of percentage deviation indicates maximum departure of the particular theory from experiment at that particular concentration and magnitude of the chi-square value finally determines the overall validity of the theory. The chi-square values along with average percentage error sigma are given in TABLE- 4.

#### CONCLUSION

From the values of experimental and evaluated velocity values, it may be concluded that, the Nomoto's relation, Impedance relation and Junjie's relation have provided good agreement. Thus, the linearity of molar sound velocity and additivity of molar volumes, as suggested by Nomoto, Impedance relation and Junjie's relation in deriving the empirical relations have been truly observed in the aforementioned binary liquid mixtures. The success of Nomoto's relation in predicting the experimental ultrasonic velocities for polar-polar liquid mixtures has also been emphasized by others.

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