

**THE FORWARD INPUT-ORIENTED EFFICIENCY ANALYSIS
OF MOLDAVIAN MICRO-LEVEL ECONOMY**

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Abstract: - In this work we will present an analysis of the economic situation of some branches of Moldova. This was possible using the technique DEA (data envelopment analysis) based on mathematical programmer approach. We're provided an analysis of some certain data concerning the efficiency or inefficiency of the branches, that use the Efficiency Measurement Programs (EMS).

Key-Words: - : efficiency score, Malmquist productivity index, efficiency measurement, technical efficiency.

The Industry of Wines.

20	2,335247	1,425872	0,398422	15,58777
21	0,966987	4,700227	0,272457	1,743561
22	5,972464	4,5	0,079142	6,012165

The scores of efficiency of the firms.

	1995	1996	1997	1998	1999
1	0,3186	0,1172	0,66	0,1553	0,2195
2	0,2768	0,1762	0,8482	0,1943	0,3375
3	0,4956	0,0908	1,179	0,6987	0,239
4	0,1773	0,0772	0,439	0,1874	0,2932
5	0,1752	0,0535	0,4531	0,1206	0,1601
6	0,2763	0,0163	0,5602	0,1962	0,2866
7	0,1237	0,4421	0,5193	0,3078	0,3041
8	0,0244	0,0503	0,6584	0,2172	0,0881
9	0,3201	0,4056	0,6705	0,2201	0,3705
10	0,2639	0,0273	0,6142	0,4277	0,0896
11	0,1953	0,1094	0,6456	0,3864	0,1914
12	0,0442	0,4289	0,2101	0,3579	0,075
13	0,2274	0,0597	0,5799	0,1986	0,0791
14	0,1988	0,0966	0,4493	1,4312	0,1702
15	0,1157	0,0157	0,5561	0,2166	0,1648
16	0,5559	2,2618	0,387	0,1433	0,3297
17	0,1527	0,0194	0,3851	0,3357	0,0834
18	0,1369	0,0238	0,6704	0,2564	0,1074
19	0,3237	0,0495	0,0001	0,275	2,2396
20	0,4934	0,0871	0,5821	0,2028	0,0376
21	0,6111	0,2605	0,5284	0,2694	0,4465
22	1,6363	0,069	0,1462	0,2565	0,1233

The Malmquist productivity indexes of the firms

	96(95)	97(96)	98(97)	99(98)
1	1,120307	1,692727	0,589826	2,044647
2	0,64756	1,97984	0,606279	1,664
3	2,25	0,734266	0,198798	8,448954
4	0,946891	1,675854	0,325507	1,847203
5	1,349533	1,126683	0,521559	2,177389
6	6,98773	0,277579	0,396534	1,978018
7	0,115359	8,11631	0,234243	2,924696
8	0,200795	0,727825	0,42081	7,125993
9	0,325197	5,766294	0,42299	1,717139
10	3,985348	0,423315	0,199439	13,79688
11	0,735832	1,615242	0,231884	5,834378
12	0,042434	19,46168	0,081587	13,79333
13	1,569514	0,980859	0,405337	7,255373
14	0,847826	2,050523	0,0436	16,98061
15	3,038217	0,269376	0,356417	3,79915
16	0,101291	24,63359	0,374738	1,255687
17	3,242268	0,479096	0,159368	11,63309
18	2,369748	0,337858	0,363105	6,89851
19	2,694949	0,4723	0,072727	0,35484

Analyzing the above situated table of scores for the firms of the industry of wines we can state that in every year of 1995-1999 [7] period we recorded only one firm with a effective score of efficiency. From the table of the Malmquist productivity indexes of the same firms we can conclude that the most favorable for all firms concerning the economic productivity was the 1997-1998 period but the 1999 was bad in this meaning, except one firm.

From the Malmquist productivity indexes decomposition in the indexes of technical change and indexes of technical efficiency change we can state, that the most favorable influence on the economic productivity had the indexes of technical change in 1996(95) and 1998(97) period, with the same approximate values of influences. More or less good influence on the economical productivity are the indexes of technical efficiency change in 1997(96). This is why we continue further the decomposition of the technical change component of the Malmquist productivity index into magnitude of technical change along a ray through period t and the bias of technical change, according to the

following formula:

$$\Delta T(x^{t+1}, y^{t+1}) = \Delta T(x^t, y^t) \bullet B(x^t, y^t, x^{t+1}, y^{t+1})$$

where:

- $\Delta T(x^t, y^t)$ is the magnitude of technical change along a ray through period t ;
- $B(x^t, y^t, x^{t+1}, y^{t+1})$ is the magnitude of the bias index.

Analyzing the above decomposition of the indexes of technical change in $t+1$ period, we can conclude about the influence of technical change indexes of t period on them. For example, the indexes of the technical change from 1996(95) period had a favorable influence on the corresponding indexes of the 1997(96) period. Later, on the same indexes of 1997(96) period influenced negative the analogously indexes of the 1998(97) period, but the same indexes of 1998(97) period had a positive influence on the corresponding indexes of 1999(98) period. Simultaneously, we can establish the influence of the bias indexes from the $t+1$ period on the magnitude of the technical change indexes in the corresponding period. For example the bias indexes from the 1997(96) and 1999(98) period, expressing the product of input bias indexes and output bias indexes through the measures of relative change in distance between the two frontiers, had the negative influence on the indexes of technical change in corresponding period, but the same indexes of the 1998(97) make a positive influence on the indexes of technical change for the same period.

We have provided the similarly analyses for the firms of canning and milk industries.

Conclusions

Effectuating the proposed analysis of the economical efficiency at the micro level (firm), by studding the input and output data for the chosen firms from three economical branches: the industry of wines, the canning industry and the milk industry in 1995-1999 period we conclude the next:

- the entrepreneurial activity is at a beginning level, and the firms activity is more or less happened;
- according to the profitableness graphs and the benefit diagrams, we can conclude that the most of them can develop in future a profitable activity, after the experimental and learning activity during 5 years;
- studding the efficiency and productivity indexes of the each firm from the proposed analysis we state that some of firms fails, but this is an ordinary phenomena of the market economy;
- it is very important for the Republic of Moldova that the entrepreneurial activity begins and continues.

We believe that this analysis is useful for the evaluation of the actual economic situation of the development to make a real appreciation of the development or stagnation factors of our market economy.

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Enclosure

The total spending of the firms of canning industry

	1995	1996	1997	1998	1999
1	1812127	1777507	1766895,65	715895,7	667808,4
2	23041968	3711425	3039967,14	845278,3	1308518
3	956177,1	1621182	1385469,31	717820,5	529144,4
4	1143027	1205569	740933,213	319659,1	400971,3
5	702779,5	596176,4	428040,93	21376,19	69839,21
6	3172685	5033482	10268885,4	2535682	4234424
7	2350167	4064537	6692868,65	1028487	4077652
8	3374,194	3467335	2518791,78	500805,2	1220039
9	6055840	6370696	6132354,23	2942092	3364207
10	1043007	1467374	2303219,84	551088,1	1009410
11	1341635	1435427	1971702,77	320658,3	501532
12	445243,6	462061,7	507329,347	29837,43	92270,72
13	29034,26	14852,14	12558,7809	12187,74	22217,77
14	1432381	1896293	1487572,95	1153454	1950216
15	102825,4	348355,7	505865,342	277083,2	590304,5

The volume of production of the firms of canning industry

	1995	1996	1997	1998	1999
1	2205784	1808682	1128303,14	129365,6	251878,2
2	3354171	2837662	3008869,9	1243793	1118812
3	2147720	1490021	1616475,74	580053,1	513038,4
4	1263426	6112487	760220,388	473701,3	516582,4
5	470522,8	532150,4	470023,773	117161,3	28098,98
6	6067186	11163570	14562739,2	8855269	3795894
7	2731924	6166017	7775899,4	7549234	2530005
8	4476,752	3401446	2972100,59	2483401	1528652
9	7464071	6048041	7895442,73	3655747	2379402
10	2116858	2041860	3426319,3	2500034	1370353
11	1466007	1776774	1182852,15	769219,8	533543,1
12	720294,5	584582	324074,419	230504,4	15382,55
13	12456,73	6320,729	7092,80639	5528,375	31007,6
14	2138354	1472083	3103387,33	2491596	2065339
15	353260,7	460719,8	1082354,63	594114,1	830276,8

The total spending of firms of the industry of wines

	1995	1996	1997	1998	1999
1	2921157	5399637	8970871	2480064,49	3013567
2	1508132	3592396	2386724	1241579,93	1679121
3	963801,3	1592080	6060570	1017769,03	4876191
4	2694927	4748024	2835432	459431,021	735213,6
5	2127697	3219632	3821494	919839,083	1612933
6	5064761	10098844	7627448	1508490,84	2621112
7	859355,5	979273,6	1547782	324639,366	518208,6
8	1336149	1436762	2622558	739930,209	1218052
9	389993,1	378844,9	477991,8	120601,188	226109,6
10	461010,9	698197,5	1237668	182614,394	576311,7
11	641980,6	731177,8	1226654	91836,3408	272922,4
12	454780	187830,6	411746,8	66888,8258	181411,9
13	259710,8	413219,7	740385,9	327418,983	623881,1
14	386905,9	374191,1	852103,7	112972,103	784691,8
15	226531,1	2540254	3522970	844422,761	1537599
16	45569,74	178746,3	225129,5	55668,7118	55606,28
17	277434	502838,2	481614,4	41364,7446	109320,8
18	242732,6	1027402	265176,3	142011,895	274926,2
19	257463,8	587612,4	338083,1	6189,32555	33152,58
20	78589,32	229266,3	1163936	574841,718	1057910
21	18121,02	172361,1	174105,5	6772,16824	18333,53
22	38757,95	229582,3	534015,9	104773,775	215226,2

The volume of production of the firms of the industry of wines

	1995	1996	1997	1998	1999
1	7228877	11928016	11707529	5484614,18	3258975
2	3243349	2725030	4002700	3435304,6	2792063
3	3711012	6906892	11983145	10126259,6	5743191
4	3711457	3249581	2461268	1226009,5	1062099
5	2896329	3105785	3423463	1579934,31	1272723
6	10871702	8160901	8448206	4213450,49	3701810
7	825589,8	1361339	1589304	1422713,94	776344,5
8	253437,2	2896074	3414030	2288830,02	528564,6
9	969774,9	358904,5	633728,8	378049,41	412712,4
10	945272,5	1507559	1503160	1112276,9	254394,5
11	974193,5	1518571	1565717	505315,542	257352,2
12	155995,6	464700,4	171029,6	340927,753	67083,15
13	458731,9	681656,3	848995,8	925783,625	243187
14	597508,3	752451,2	757040,5	1608707,88	657910,9
15	203684,7	3369236	3873418	2605046,33	1248671
16	196780	183471,2	172260	113559,653	9034

	.2				2,78
17	329110,8	460137,7	366727,8	197736,398	4494,5,46
18	258064,5	548776,1	351492,5	518441,271	1455,24,4
19	64749,7,2	376245,6	77,3119,4	24234,260,6	163,348,6
20	30124,8,1	846402,5	1339527	1660156,6,9	196,046,6
21	86029,14	298655	181898,4	25977,732,6	403,34,2,7
22	30109,0,1	218318,1	154418,8	382692,10,1	130,791

11	355572,9	136576	22968	21444,71	795023,9
12	971679,6	902766,4	946650,8	113744,11	175083,4
13	642049,7	511428,2	512838,8	322306,3	200738,5
14	369127,9	266497,8	788704,6	327015,5	42495,61
15	569161,3	601962	378356,8	268815,7	28711,76
16	728520,6	451750,5	210813,5	94980,87	186162,1
17	168582,9	121476,3	107019,5	124126,5	13922,92

The total spending of firms of the milk industry

	1995	1996	1997	1998	1999
1	419281,4	336706,1	346106,3	79250,39	215535,4
2	788450,5	422330,3	244349,4	35044,14	88362,85
3	1450702	1310767	882129,4	130000,1	329520,4
4	733926,6	543590,5	564400,3	241165,1	391456,1
5	1619320	1616960	1509798	92685,76	336046,9
6	708630,7	761490,4	522963	136583,6	330521,9
7	1194129	1092557	796610,7	49352,11	144771,5
8	154632,5	129705,1	88853,56	7396,506	20613,26
9	1270745	1173821	1130977	268286,3	702240,5
10	1456926	1264830	742653,1	17303,79	42060,88
11	501905,7	398394,4	185988,3	86905,45	549378,3
12	6971859	7188786	8296518	742531,5	149332,9
13	4139198	5101641	4863304	484419,2	161898,9
14	497723,2	322784	250123,6	1234509	164275,9
15	748341,7	513367,5	456456,5	39866,75	79272,12
16	566329,7	411365,3	525193,9	26702,84	914974,3
17	1255012	1315080	1182038	262629,8	30975,12

	1993	1994	1995	1996	1997	1998	1999
The yearly average value of inflation	32	6,2	1,8	3,5	1,9	1,3	5,4
The official curs of \$	1,4483	4,0667	4,495	4,6062	4,6236	5,3686	10,5242

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The volume of production of firms of the milk industry

	1995	1996	1997	1998	1999
1	418465	322229,1	420150,4	417212,8	201080,7
2	415169,1	202336,4	107650	96562,72	37289,79
3	168549,7	104156,6	814267	547450,2	751437,5
4	612680,8	459727,6	672634,4	660095,9	245395,3
5	278798,7	206142,7	820080,7	442841,9	15357,4
6	104649,6	581691,8	616649,9	666355	395647,9
7	115786,5	916936	578711,6	35392,48	145979,7
8	129228,7	81519,14	68479,92	30747,7	13163,49
9	142950,0	122945,8	159449,8	142348,6	471411,9
10	144223	780393	335297	224808	8591,2