A statistical pattern for export performance of spinning and weaving sector and predicting the companies shares by using Markov Method

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1. Introduction:

The expansion of the commodities exports is consider the most essential approach for social and economic development of Egypt as they are an important hard currency source.

At present, the revenues from commodities exports without petroleum products represent marginal share of the total exports values (Table 1 Appendix). Table 2 Appendix illustrate that the average share per capita from total value of the commodities exports (including petroleum) in 1995, is rather low comparing with many other developing countries.

The difficult of the commercial balance was estimated at L.E 1269.8 million in 1980 and has been increased to L.E 20536.4 million in 1994, i.e. increased by 18.2 times during this period (Table 3 appendix). To control the difficult of the commercial balance considerable measures should be taken for the expansion of the commodities exports.

Traditionally, spinning and weaving industries are of great importance of the national economy. They provide local market with textile products, considerable number of jobs opportunities and earn hard currency from exports.

Table 4 Appendix illustrate that the spinning and weaving industries have many economic advantageous against other public sector industries. They use marginal imported inputs, provide higher number of work opportunities, and occur higher added value; the major share of industrial products exports and the higher ratio export production.

2. Objectives of the study:

The main general objective of the study is to predict the trends of spanning and weaving exports as well as the contribution of each of the companies operating in these activities in the expected exports the years 1996-2005.

3. Importance of the study:

It is expected that the results concluded from the study will help spanning and weaving companies to put proper plans and efficient marketing policies for expansion their exports during the coming years.

4. Scope of the study:

The study in concentrated on the 31 companies belongs to the public business sector. These companies are divided into three categories:

1- Holding company for spinning, weaving and Ready-made clothes at Abdeen.

2- Holding company for Cotton and international trade at El-Zamalek.

3- Textures industry and foreign trade company at El-Mohandessen.

The private sector companies were excluded due to the shortage of regular data as well as they contribution are marginal.

5. Methodology:

To achieve the objectives of the study quantitative techniques was use. Markov Method was implemented for prediction.

(I) Defining MarKov method:

MarKov Method is one of the mathematical methods that can be used in predication [1]. The Russian A.A. Markov creates this mathematical method at the beginning of this century in 1906–1907. N. Winer put the statistical assembly in Markov method for the first time in 1923.

Also P. Levy, W. Doeblin, W. Feller, A.N. Kolmogorov, T.L. Doop and other Scientists have shared in developing the general theory in the 1930s and 1940s of this Century [2]. Markov method is a way for analysing the actual action of a variable trying to predict the future action of the same variable.

(II) Markov Process steps: (3)

1- Preparing main data required for analysis.

2- Calculating transition probabilities matrix (specifying the potential motion matrix) i.e. putting previous data in brief in order to appear in the form of Transition Probabilities. These probabilities could be made in the form of Transition Matrix, its symbol is (P), (Pij) symbolizes every factor in this matrix, every company symbol (s), the periodical time symbol is (n), and the gross number of stages is (m). On this basis, we can visualize the transition probabilities Matrix is a form that illustrates transition from state (I) to state (j) as follows: [4]

(1) Buffa, Elwoods andjames S.Dyer, Essental of Management Science: Operations Research, John Wily and Sones, Inc., New York, 1978, P. 186.

(2) Thierauf, Robert j., An introductory Approach to operations Research, John Wily and Sons, Inc, New York, 1978, P. 269.

(3) a. Brown. Kenneths., ad jack B. Revelle, Quantitive Methods for Managerial decisions, Addison. Wesely Publishing company, London, 1978, P. 393-394
b. Thierauf. Robert j., Op. Cit., P. 284.

(4) Shamblin, James E., and G.T. stevens, operations Research fundamental Approoch, Me grow-Hill, Inc., 1974, P. 55-77.

From Present   *To next*

(n = 0)   (n = 1)

$$P = \begin{array}{c} \\ S_1 \\ S_2 \\ . \\ . \\ S_m \end{array} \begin{array}{cc} S_1 & S_2 \ldots \ldots \ldots S_m \\ \begin{bmatrix} P_{11} & P_{12} \ldots \ldots \ldots P_{1m} \\ P_{21} & P_{22} \ldots \ldots \ldots P_{2m} \\ . & . \quad . \\ . & . \quad . \\ P_{m1} & P_{m2} \ldots \ldots \ldots P_{mm} \end{bmatrix} \end{array}$$

These following conditions must be available in the previous transition probabilities matrix: [5]

a. $0 \le P_{ij} \le 1$

b. $\sum\limits_{j=1}^{m} P_{ij} = 1$ $I = 1.2 \ldots \ldots \ldots, m$

In order to describe Markov process fully, it is necessary to know the current state and transition probabilities. The current state can be described as the last event that took place directly in the previous period or the existing transition state by which the transition analysis starts. The transition probabilities are the transition change in probable states.

3- Predicting the expected portions for companies during the coming period i.e. the account of future potential market shares.

4- Predicting the equilibrium conditions and specifying the equilibrium condition. Equilibrium state means that the share of the various competing companies in the market will not be changed.

(III) Markov Method Hypothesis:

1- The time period of prediction will be in the moderate or short term.

2- The market size will be fixed during the time period specified for prediction.

3- The probabilities steadiness from time to time, if there are changes in these probabilities, it necessarily results in changing the structure of the transition probabilities matrix. This requires amending the matrix to express any change that may occur in these probabilities.

4- Markov process takes three orders:

A- First order Markov process, it is based on the hypothesis that the probability of the next event depend entirely on the results of the direct previous event.

B- Second order Markov process; it is hypothesized that the event probability in the next time is based on the results of the two direct previous events.

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(5) Wadsworth George P. and Joseph G. Bryan, Applications of Probability and Random Variables, Second edition, Mc Grow-Hill, Inc., 1974, P. 341.

C- Third order Markov process, it is hypothesized that the future behaviour of the phenomenon can be predicted by studying its behaviour in the three time period prior to the period of prediction. As Markov analysis of the first order does not require a lot of complicated mathematical operations and can depend upon future prediction, so we will be satisfied by its study alone.

5- The absence of new companies that export for the first time and that the current companies will not stop exporting.

6- The data about exports and its change from time to time could be provided during the time period specified for prediction.

(IIII) Usage of Markov Processes:

1- Predicting the company share in the market in the coming period.

2- Predicting the future rate of the company's gain or loss of its share in the market.

3- Predicting the future probability of the equilibrium state in distributing shares in the market.

4- Comparing between alternative strategies for marketing and evaluating these strategies to choose the best.

(V) Reasons of using Markov Method:

There are a lot of reasons that made the researcher use Markov method represented in the following:

1- Markov method enables us to predict the potential share of each company of spinning and weaving and indicating the charge in the share of each company as for the other competing companies from one year to another. No doubt, these predictions enable the spinning and weaving companies to draw its marketing policy on the light of this knowledge, so as to reach the highest grades of its power efficiency and its marketing resources [6]. Also specifying the rate of change in the company share as for exports as regards to other companies from one year to another, enables each company to make a study for its reasons and imposing the suitable marketing policies to treat the reasons of its weak competitive status so as to strengthen its status in the market.

2- Marco N method is a tool in the hand of the administration for market analysis, using this tool enables us enable spinning and weaving companies to conclude precise results for its situation in the market actually and in the future. This type of analysis is necessary for specifying the success of each company as for its competition with other companies in acquiring new markets or its losses for the actual markets.

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[6] a. Levin; Richard L., and Charles A. Kirt Patrick, Quantative Approaches to Management, Mc Graw Hill, Kogakusa, Ltd, London, 1975, P. 452-454.
  b. Murdick, Robert G. Mathematical Models in Marketing intext educational publishers, London, 1972.

3- Markov method is a modern application in the field of spinning and weaving sector in Egypt, as it was not used in this field before.

4- Applying Markov method does not require a lot of data required for fulfilling the mathematical operation as in the case of the traditional prediction patterns, which on may need-as the declinations patterns to the preparation of data for several years that may reach 20 years or more. While Markov method requires preparing data for one previous year. No doubt, the previous advantages of Markov method results in providing time, effort and costs together with the factor of accuracy in the same time.

(VI) Markov Process Criticism:

1- The probability transition remains fixed.

2- The memory goes on to the direct previous event only.

3- The probability transition matrix is hard to reach it sometimes this also may be costly.

Inspite these criticisms, we must take in consideration, that it took place because of trying to apply these patens in soling real problems and it is hard to represent this reality actually as the pattern is an approximation to this reality.

6. Pattern Practical Application:

Firstly:

Preparing the main data required for analysis by using Markov method, where there is a difference between exports 89-99 for each company and setting exports rates of each company for year 99 by dividing the exports of each company by the total exports. These the difference is distributed by new rates to find the gain matrix, then finding the loss matrix by transferring lines to columns. The exports of the beginning of the following year (2000) by low as follows:

Exports (99) + gain matrix (during the year)-loss matrix. For each row, then find companies shares at the beginning of the following year (99) by dividing each number in the previous column by the total equal to = 7.

Secondly:

Calculating transition probabilities matrix: By dividing each column of the loss matrix by the exports to find preservation of exports then loosing exports of the first, then the second then the third company.

Thirdly:

Predicting potential shares during 2001-2010: By multiplying the outcome companies shares x the transition proba0bility matrix and the result is multiplied by x transition probability matrix ..... so on.

Fourthly:

Predicting equilibrium state: Markov method also is considered a tool for analysing the market on the long run as we can receive long term predictions by reaching the equilibrium states. Since we have 27 equations and 26 unknown, one of these equations were ignored which is the one before the last and the 26 reaming ones to find the share of each company at state of equilibrium. By slowing these equations, the researcher reaches the company shares.

A program was made for Markov process because of the wide–spread companies upon which this research is applied.

From Table 8, the following is concluded:

1- Misr for Spinning and Weaving at El Mahala El Kobra occupies the first rank in 2001, followed consequently by Middle Egypt Company, then comes El Sharkia Company for Cotton in the third rank, then Alexandria for Spinning and Weaving, then Misr for Manufactured Silk, then Al-Ahlia for Spanning and Weaving–Alex, then Misr– Helwan for Spinning and Weaving, then Misr for Manufacturing Spinning and Weaving Equipments, then El-Seouf for Spinning and Weaving, then Misr for Fine Spinning and Weaving at Kafr El-Dawar, the Dommaitta for Spinning and Weaving, then El Aammah for Jute Production then El-Nasr for Spinning and Weaving and Tricot (Shcrbagy) then Cairo for Clothes and Tricot (Tricona), then El-Nasr for Clothes and Texture (Cabo), then El-Nasr for Wool and Excellent Texuture (Stea), then El-Dakahlia for Spinning and Weaving, then El-Sharkia for Spinning and Weaving at El Zagazig, then the South Side for Spinning and Weaving, then El-Arabia and El-Motahda for Spinning and Weaving, then Industrial Stores for Silk and Cotton (ESCO) then Port Said for Spinning and Weaving, then Misr Shebien-El-Kom for Spinning and Weaving, then Delta for Spinning and Weaving then El-Nasr for Spinning and Weaving and Dyeing at El-Mahala-El-Kobra.

2- Competition among spinning and weaving companies will go on for the greatest portions in the market. It is remarkable that during 2002, Dommaitt Spinning and Weaving share will increase more than 2001 by (0.007). Also El-Dekahlia for Spinning and Weaving Co. share will increase by (0.0380.3), El-Delta for Spinning and Weaving Co. will increase by (0.0167), El-Nasr for Clothes and Texture (Cabo) by (0.03294) El-Nasr for Spinning and Weaving and Dyeing at El-Mahala-El-Kobra by (0.00076), El Arabia and El-Motahda for Spinning and Weaving by (0.00792), Misr Shebin-El-Kom by (0.00249), Misr Sabaghy-El-Beida by (0.03808), Port said for Spinning and Weaving by (0.01408), Industrial Stores for Cotton and Silk (Esko) by (.02504), El-Nasr for Spinning and Weaving and tricot (Shourbagy) by (0.06301) South Side for Spinning and Weaving by (0.10967), Cairo for Clothing and Tricot (Tricona) by (0.00294) El-Amaa for Jute Products by (0.03236).

From the other hand it is expected that Misr for Spinning and Weaving at El-Mahala-El Kobra sha lose by (0.00594), Misr Helwan for Spinning and Weaving by (0.00287), Misr for Manufacture Silk by (0.01592), El-sharkia for Cotton and Linen by (0.06102), Misr for Manufacturing Spinnin and Weaving Equipments by (0.02133), El-Sharkia for Spinning and Weaving at El-Zagazig b; (0.0022) Misr for Fine Spinning and Weaving at Kafr-El-Dawar by (0.00782), El Nasr for Woo and Excellent Texture (Stea) by (0.01345), El-Ahlia for Spinning and weaving – Alexandria b; (0.04842), El-Seiof for Spinning and Weaving by (0.00144), Alexandria for Spinning and Weaving by (0.059), Middle Egypt for Spinning and Weaving by (0.10585) . etc.

These' concluded predictions by using Markov methods may be considered as proper targets of Spanning and Weaving companies. Hence, each company should effort to get predicted shares or to avoid reasons causing decreasing shares through proper marketing policies.

7. Results and Recommendations

These companies must change its point of view in analysing its exports, this may happen if each company takes in consideration the factor of the competition of other companies to it, so that its activity promotion expresses the actual exploitation for its human and financial abilities.

Spinning and weaving companies must depend on applying quantitative methods to analyse its exports. This research may be a guide and direct than to the method of applying these scientific methods in this field i.e. Markov method.

Table 1

No	Symbol	Company	Export 98	Export 99	Export 99%	Differenc
1	x_1	Misr for Spinning and Weaving	361.166	434.268	23.91%	73.10:
2	x_2	Misr Helwan	2.741	3.621	0.20%	0.88(
3	x_3	Misr for manufacturing silk	1.994	4.87	0.27%	2.87(
4	x_4	Eastern for cotton	15.355	25.219	1.39%	9.86∠
5	x_5	Domiat for Spinning and Weaving	64.489	82.252	4.53%	17.76:
6	x_6	Eldakahlya for Spinning and Weaving	63.832	107.356	5.91%	43.52∠
7	x_7	Eldelta for Spinning and Weaving	100.560	128.907	7.10%	28.347
8	x_8	Kapo	34.408	38.793	2.14%	4.385
9	x_9	Misr for Spinning and Weaving Equipments	0.087	0.043	0.00%	0.044
10	x_{10}	Eastern for Spinning and Weaving	34.320	26.426	1.45%	7.894
11	x_{11}	Misr in Kafr Eldawar	208.511	296.295	16.31%	87.784
12	x_{12}	Elnaser in Elmahla Elkobra	16.135	30.351	1.67%	14.216
13	x_{13}	Arabic for Spinning and Weaving	137.868	173.179	9.53%	35.311
14	x_{14}	Misr in Sheben Elkom	125.712	162.539	8.95%	36.827
15	x_{15}	Elnasr Stea	65.928	88.076	4.85%	22.148
16	x_{16}	National for Spinning and Weaving Alexandria	12.947	16.066	0.88%	3.119
17	x_{17}	Misr Elbeda	2.908	6.393	0.35%	3.485
18	x_{18}	Port Said for Spinning and Weaving	2.146	15.312	0.84%	13.166
19	x_{19}	El Syof for Spinning and Weaving	62.184	74.35	4.09%	12.166
20	x_{20}	Alexandria for Spinning and Weaving	53.146	58.128	3.20%	4.982
21	x_{21}	Esco	10.637	18.099	1.00%	7.462
22	x_{22}	Shorbagy	1.063	13.158	0.72%	12.095
23	x_{23}	Upper Egypt for Spinning and Weaving	3.489	4.111	0.23%	0.622
24	x_{24}	Trecona	4.922	5.595	0.31%	0.67:
25	x_{25}	El-Got	3.033	0.452	0.02%	2.581
26	x_{26}	Middle Egypt for Spinning and Weaving	2.214	2.696	0.15%	0.482
		Total	1391.795	1816.555		

Table 2

Profit Matrix (Ratio)

Companies	X₁	X₂	X₃	X₄	X₅	X₆	X₇	X₈	X₉	X₁₀	X₁₁	X₁₂	X₁₃	X₁₄	X₁₅	X₁₆	X₁₇	X₁₈	X₁₉	X₂₀	X₂₁	X₂₂	X₂₃	X₂₄	X₂₅	X₂₆

Table 3

Profit's Matrix (figures)

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24	X25	X26
X1		0.19650	0.25755	1.33370	4.33988	5.67750	6.81733	2.05156	0.00227	1.39753	15.66951	1.60511	9.15854	8.59585	4.65789	0.84965	0.33609	0.80977	3.93159	2.07409	0.95176	0.69586	0.21741	0.29589	0.02390	0.14258
X2	0.21079		0.00236	0.01224	0.03993	0.05211	0.06257	0.01893	0.00002	0.01283	0.14382	0.01473	0.07406	0.78900	0.04375	0.00780	0.00310	0.07430	0.03609	0.03822	0.00879	0.06639	0.00200	0.00272	0.00022	0.00014
X3	0.68939	0.00575		0.04003	0.13057	0.17042	0.20464	0.06158	0.00007	0.04195	0.47036	0.04818	0.27492	0.25803	0.13932	0.02550	0.01015	0.02431	0.11803	0.09228	0.02873	0.02089	0.00653	0.00889	0.00072	0.00428
X4	2.39120	0.01994	0.26870		0.45292	0.59116	0.70983	0.21361	0.00024	0.14551	1.63155	0.16713	0.95361	0.89502	0.48499	0.08847	0.03520	0.08132	0.40941	0.32080	0.09966	0.07245	0.02264	0.02081	0.00249	0.01485
X5	4.44784	0.41209	0.04988			1.09956	1.28256	0.39732	0.00044	0.27066	3.03470	0.31086	1.77273	1.66475	0.10299	0.16455	0.06548	0.15683	0.76150	0.59536	0.18537	0.13477	0.04211	0.57290	0.00463	0.02761
X6	11.05814	0.09221	0.12401	0.64219	2.09451		1.80323	0.98785	0.00109	0.67293	7.54502	0.77287	4.40993	4.13898	2.24292	0.40911	0.16279	0.38991	1.89329	1.48020	0.46088	0.33506	0.10468	0.14247	0.01151	0.06965
X7	7.39429	0.06082	0.08190	0.42360	1.38157	1.80323		0.65160	0.00072	0.44387	4.97679	0.50960	2.90884	2.73013	1.47939	0.26986	0.10738	0.25719	1.24884	0.97636	0.30400	0.22101	0.06985	0.09398	0.07590	0.04228
X8	1.87116	0.00893	0.01201	0.06220	0.20788	0.26480	0.31796		0.00011	0.06518	0.73084	0.07486	0.43716	0.40092	0.31725	0.03963	0.01577	0.03770	0.18339	0.14338	0.04464	0.03246	0.01014	0.01380	0.01111	0.00665
X9	0.01052	0.00009	0.00012	0.00061	0.00199	0.00260	0.00312	0.00094			0.00718	0.00074	0.00419	0.00393	0.00213	0.00039	0.00015	0.00037	0.00018	0.00141	0.00044	0.00032	0.00010	0.00014	0.00001	
X10	0.19150	0.01597	0.02148	0.11121	0.39371	0.47341	0.56845	0.17107	0.00019		1.30658	0.13384	0.76367	0.71675	0.38839	0.07085	0.02819	0.06752	0.32786	0.25633	0.07981	0.05802	0.01813	0.02467	0.00019	0.01189
X11	25.07583	0.20999	0.28121	1.45621	4.74946	6.19903	7.44345	1.24004	0.00248	1.52591		0.75255	9.99984	9.38545	5.08575	0.92770	0.36915	0.88416	4.39367	3.35647	1.04509	0.75978	0.23738	0.33307	0.03610	0.15567
X12	3.45624	0.02882	0.03876	0.20071	0.64463	0.85442	1.02594	0.30874	0.00034	0.21032	2.35815		1.37839	0.40092	0.70098	0.13787	0.05988	0.12186	0.59174	0.46363	0.14405	0.10472	0.03272	0.04453	0.06300	0.03646
X13	9.33106	0.10464	0.10464	0.54188	1.76734	2.30674	2.76981	0.83354	0.00092	0.56781	6.36645	0.65215			1.89248	0.35521	0.13737	0.32901	1.59755	1.24999	0.38889	0.28372	0.08933	0.12022	0.00971	0.05721
X14	9.66907	0.08062	0.10843	0.56151	1.83136	2.39030	2.87014	0.86373	0.00096	0.58838	6.59707	0.67577	1.37839		1.96101	0.35771	0.14334	0.34092	1.65541	1.29423	0.40399	0.29297	0.09135	0.12457	0.01006	0.06093
X15	5.56453	0.04640	0.06240	0.32315	1.05394	1.37561	1.65176	0.49708	0.00055	0.33861	2.79660	0.38890	2.21904	2.21904		0.30596	0.08192	0.19620	0.15269	0.74483	0.23191	0.16869	0.05268	0.07169	0.00579	0.03455
X16	0.75229	0.00627	0.00844	0.14349	0.14349	0.18597	0.22331	0.06720	0.00007	0.04578	0.51337	0.05258	0.30000	0.29157	0.15237		0.01107	0.02653	0.12880	0.10070	0.03125	0.02271	0.00712	0.00969	0.00078	0.00467
X17	0.83607	0.00697	0.00938	0.04855	0.15836	0.20669	0.22818	0.07469	0.00008	0.05088	0.57044	0.05843	0.33341	0.31393	0.16957	0.03092		0.02948	0.14364	0.11191	0.03484	0.02533	0.00791	0.01077	0.00087	0.00519
X18	3.17424	0.01647	0.03560	0.18434	0.60121	0.78471	0.94323	0.28355	0.00031	0.19316	2.16574	0.22185	1.26589	1.18806	0.64378	0.11743	0.04672		0.54345	0.42388	0.13999	0.09618	0.02905	0.04999	0.00316	0.01976
X19	3.03254	0.01529	0.03401	0.17611	0.57437	0.74968	0.90017	0.28355	0.00030	0.18454	2.06906	0.21194	1.20933	1.13583	0.61504	0.11219	0.04464	0.10693		0.04859	0.13999	0.09618	0.02871	0.04990	0.00316	0.01883
X20	1.22037	0.01380	0.02021	0.07145	0.33304	0.34416	0.36522	0.10991	0.00012	0.08737	0.83947	0.08599	0.49065	0.46051	0.24954	0.04552	0.01811	0.04338	0.21065	0.04859	0.12639	0.03728	0.01165	0.03371	0.01385	0.00764
X21	1.80133	0.01502	0.02021	0.10464	0.34137	0.44543	0.53485	0.16096	0.00018	0.10964	1.22936	0.12593	0.71854	0.67439	0.36544	0.06660	0.02653	0.06353	0.30849	0.24118		0.05459	0.01706	0.03321	0.00188	0.01119
X22	2.91354	0.02429	0.03266	0.16914	0.55165	0.72001	0.86455	0.26018	0.00029	0.17723	1.18719	0.20356	1.16147	1.09011	0.59071	0.10775	0.04288	0.10261	0.49665	0.38985	0.12139		0.02757	0.03752	0.00302	0.01998
X23	0.14902	0.00124	0.00167	0.00865	0.02822	0.03684	0.04442	0.01331	0.00001	0.00907	0.10168	0.10418	0.06147	0.05578	0.03023	0.00551	0.00219	0.00525	0.02552	0.09995	0.00621	0.00452		0.00192	0.00026	0.00093
X24	0.16119	0.00135	0.00181	0.00937	0.03657	0.03990	0.04791	0.01442	0.00020	0.06981	0.11011	0.01128	0.06436	0.06940	0.03273	0.00597	0.00238	0.00561	0.02763	0.02660	0.06673	0.00152			0.00017	0.00100
X25	0.61717	0.00515	0.00692	0.03584	0.11689	0.15757	0.18320	0.05513	0.00006	0.03756	0.42109	0.04313	0.24612	0.23100	0.12170	0.02283	0.09909	0.02176	0.15066	0.08261	0.02572	0.00584	0.00795			0.00392
X26	0.11540	0.00096	0.00129	0.06670	0.02186	0.02853	0.03425	0.01031	0.00001	0.00702	0.07374	0.00897	0.04602	0.04319	0.02340	0.40437	0.00170	0.00407	0.01976	0.01545	0.00481	0.00350	0.00169	0.00149	0.00012	

Table 4

Loss Matrix

Components	X₁	X₂	X₃	X₄	X₅	X₆	X₇	X₈	X₉	X₁₀	X₁₁	X₁₂	X₁₃	X₁₄	X₁₅	X₁₆	X₁₇	X₁₈	X₁₉	X₂₀	X₂₁	X₂₂	X₂₃	X₂₄	X₂₅	X₂₆
X₁		0.21079	0.68939	2.39130	4.44784	11.05844	7.29439	1.07116	0.01052	1.91501	25.07583	3.45624	9.33106	9.66907	5.56453	0.75229	0.86497	3.17424	3.03245	1.23017	1.80183	2.11254	0.14692	0.16139	0.61272	0.18540
X₂	0.19650		0.00575	0.01994	0.03709	0.09221	0.06082	0.00893	0.00009	0.01597	0.28949	0.02883	0.07780	0.08062	0.04640	0.00627	0.00697	0.02647	0.02529	0.01026	0.01502	0.92429	0.00012	0.00125	0.00515	0.00026
X₃	0.25755	0.00236		0.02682	0.04928	0.12401	0.01180	0.01281	0.00001	0.02148	0.28121	0.01876	0.10464	0.10843	0.66240	0.00844	0.00938	0.03560	0.03401	0.01380	0.02021	0.03266	0.00167	0.00181	0.00692	0.00139
X₄	1.33370	0.01224	0.04063	0.25830	0.64719		0.43360	0.06220	0.00061	0.11121	1.45621	0.20071	0.54188	0.56151	0.32315	0.04369	0.04855	0.18434	0.17611	0.07145	0.10464	0.16914	0.00865	0.00937	0.03584	0.00630
X₅	4.34988	0.03993	0.13057	0.45292		2.69451	1.31157	0.29288	0.00177	0.36271	4.74946	0.65463	1.76734	1.83136	1.05394	0.14249	0.15836	0.60121	0.57437	0.22304	0.34127	0.55165	0.02833	0.03057	0.11689	0.03646
X₆	5.67750	0.05211	0.17043	0.59116	1.09956		1.80333	0.26480	0.00356	0.47341	6.19990	0.85442	2.30674	2.39030	1.37561	0.18597	0.20669	0.78471	0.74965	0.30416	0.44513	0.72001	0.03684	0.03990	0.15257	0.02853
X₇	6.31733	0.06257	0.20464	0.70983	1.32029	3.38256		0.31796	0.00312	0.56845	7.44345	1.02594	2.76981	2.87014	1.65176	0.22331	0.24818	0.94223	0.90017	0.36522	0.53495	0.46455	0.04434	0.04791	0.18320	0.04235
X₈	2.45156	0.01883	0.06158	0.21361	0.39732	0.98785	0.65160		0.00074	0.17107	2.24001	0.30874	0.83354	0.86373	0.49708	0.06720	0.07469	0.28355	0.27025	0.10991	0.16096	0.26018	0.01331	0.01442	0.05513	0.01036
X₉	0.00227	0.00002	0.00007	0.00024	0.00044	0.00109	0.00072	0.00011		0.00019	0.00248	0.00034	0.00092	0.00096	0.00055	0.00007	0.00008	0.00031	0.00030	0.00012	0.00018	0.00029	0.00001	0.00002	0.00006	0.00001
X₁₀	1.39753	0.01283	0.04195	0.14551	0.27066	0.67293	0.44387	0.06518	0.00044		1.52591	0.21032	0.56783	0.58584	0.33861	0.04578	0.05088	0.19315	0.18454	0.07487	0.10944	0.17733	0.00902	0.00982	0.03756	0.00302
X₁₁	15.66951	0.14382	0.47036	1.63155	3.03470	7.54502	4.97676	0.73084	0.00718	1.30658		2.35815	6.36645	6.59707	3.79660	0.51337	0.57044	2.16574	2.06909	0.83947	1.32936	1.98769	0.10168	0.11811	0.43189	0.07774
X₁₂	1.60511	0.01473	0.04818	0.16713	0.31086	0.77287	0.50980	0.07486	0.00074	0.13284	1.75255		0.65215	0.67577	0.28690	0.05958	0.05842	0.22185	0.21194	0.08599	0.11592	0.30256	0.01042	0.01119	0.04343	0.00507
X₁₃	9.15854	0.08406	0.27492	0.95361	1.77373	4.40993	2.90884	0.13716	0.00419	0.76367	9.99984	1.37829		3.85587	2.21904	0.30000	0.33341	1.27583	1.20933	0.49965	0.71854	1.61647	0.05943	0.06476	0.3161?	0.03602
X₁₄	8.59585	0.07898	0.25803	0.89502	1.66475	4.13898	2.73013	3.40092	0.00394	0.71675	9.38545	1.29361	3.49245		2.08271	0.28157	0.31293	1.18806	1.13503	0.44051	0.76439	1.09026	0.85578	0.06504	0.33100	0.03961
X₁₅	4.65789	0.04275	0.13932	0.48499	0.90209	2.24283	1.47939	0.21723	0.00223	0.38839	5.08575	0.70098	1.89248	1.96183		0.15257	0.16957	0.64378	0.61584	0.24954	0.36544	1.86066	0.03826	0.03823	0.12513	0.06910
X₁₆	3.84965	0.07890	0.02559	0.08847	0.16455	0.40911	0.26986	0.03663	0.00039	0.07085	0.92770	0.12767	0.34521	2.35771	0.20586		0.03092	0.11743	0.11219	0.04552	0.06666	1.90760	0.00551		0.00226	0.00427
X₁₇	0.33809	0.00310	0.01915	0.03520	0.06548	0.16279	0.10738	0.01577	0.00015	0.02819	0.36915	0.05098	0.13727	0.14334	0.08192	0.01107		0.04673	0.00446	0.01811	0.02653	0.17256	0.00261		0.00909	0.0021?
X₁₈	0.89577	0.00743	0.02431	0.08732	0.15743	0.38991	0.25719	0.03777	0.00041	0.06752	0.88416	0.12186	0.32901	0.34097	0.19625	0.02653	0.02948		0.11809	0.04338	0.04255	0.04288	0.00525	0.00569	0.03176	0.00107
X₁₉	3.93199	0.03609	0.11803	0.40954	0.76150	1.89232	1.24884	0.18339	0.00180	0.32786	4.29317	0.59174	1.59755		0.95269	0.12880	0.14314	0.54345	0.51800	0.21065	0.30849	0.02690	0.02552	0.01720	0.10566	0.01976
X₂₀	3.07469	0.02822	0.09228	0.37408	0.59536	1.48022	0.97636	0.14338	0.00141	0.25633	2.35647	0.86263	1.24889	1.35823	0.74483	0.10076	0.11191	0.42488	0.42488		0.24118	0.49865	0.01115	0.02150	0.64261	0.01545
X₂₁	0.95716	0.00879	0.02873	0.09946	0.18537	0.46098	0.30400	0.04464	0.00044	0.07981	1.04599	0.14405	0.38869	0.40298	0.23191	0.03135	0.03484	0.13229	0.12639	0.05128		0.33985	0.00621	0.00613	0.02572	0.00489
X₂₂	0.49586	0.00639	0.02089	0.07245	0.13477	0.33596	0.22101	0.03246	0.00032	0.05807	0.75978	0.10472	0.28373	0.29397	0.16860	0.02171	0.02533	0.09618	0.09188	0.03728	0.05459		0.06452	0.00489	0.01879	0.00350
X₂₃	0.31741	0.00200	0.00653	0.02264	0.04311	0.10468	0.06905	0.01014	0.00010	0.01813	0.23738	0.03272	0.08833	0.09153	0.05268	0.07620	0.00791	0.03065	0.02871	0.01165	0.01796	0.02757		0.00153	0.00584	0.00350
X₂₄	0.29589	0.00272	0.00888	0.03081	0.05730	0.14347	0.09398	0.01380	0.00014	0.02467	0.33307	0.04453	0.12022	0.12457	0.07169	0.00969	0.01077	0.04690	0.03907	0.01555	0.02321	0.03752	0.00112		0.00765	0.00149
X₂₅	0.03390	0.00022	0.00072	0.00249	0.00463	0.01155	0.00111	0.00001	0.00001	0.00099	0.02610	0.00360	0.00971	0.01006	0.00579	0.00078	0.00087	0.00330	0.00316	0.00128	0.00188	0.00392	0.00916	0.00017		0.00920
X₂₆	0.14258	0.00131	0.00428	0.01485	0.02761	0.06868	0.06665	0.00007	0.00007	0.01109	0.15567	0.02146	0.05793	0.06002	0.02455	0.00467	0.00519	0.01971	0.01882	0.00765	0.01119	0.00181	0.00093	0.00100	0.00383	

Table 5

No.	Company	Export 99	Companies quota 99
1	X_1	410.402	0.226
2	X_2	3.503	0.002
3	X_3	6.409	0.004
4	X_4	28.257	0.016
5	X_5	78.141	0.043
6	X_6	123.965	0.068
7	X_7	123.318	0.068
8	X_8	32.560	0.013
9	X_9	0.075	0.000
10	X_{10}	27.138	0.015
11	X_{11}	319.358	0.176
12	X_{12}	36.427	0.020
13	X_{13}	164.383	0.090
14	X_{14}	158.096	0.087
15	X_{15}	87.028	0.048
16	X_{16}	14.776	0.008
17	X_{17}	8.125	0.004
18	X_{18}	24.361	0.013
19	X_{19}	66.501	0.037
20	X_{20}	47.221	0.026
21	X_{21}	20.638	0.011
22	X_{22}	21.707	0.012
23	X_{23}	3.599	0.002
24	X_{24}	4.725	0.003
25	X_{25}	2.909	0.002
26	X_{26}	2.434	0.001
	Total	1816.555	1.000

Table 6

Companies	Export at beginning of 1999	Companies quota at beginning of 1999
X_1	410.40170	0.22592
X_2	3.50272	0.00193
X_3	6.40875	0.00353
X_4	28.25698	0.01556
X_5	78.14137	0.04302
X_6	123.96460	0.06824
X_7	123.81820	0.06816
X_8	32.55997	0.01792
X_9	0.07513	0.00004
X_{10}	27.13830	0.01494
X_{11}	319.35830	0.17580
X_{12}	36.42633	0.02005
X_{13}	164.38310	0.09049
X_{14}	158.09560	0.08703
X_{15}	87.02808	0.04791
X_{16}	14.77578	0.00813
X_{17}	8.12471	0.00447
X_{18}	24.36111	0.01341
X_{19}	66.50147	0.03661
X_{20}	47.22111	0.02599
X_{21}	20.63759	0.01136
X_{22}	21.70732	0.01195
X_{23}	3.59905	0.00198
X_{24}	4.72487	0.00260
X_{25}	2.90881	0.00160
X_{26}	2.43414	0.00134
Total	1816.555090	1.000000

Table 7

Transportation probability matrix

Companies	X₁	X₂	X₃	X₄	X₅	X₆	X₇	X₈	X₉	X₁₀	X₁₁	X₁₂	X₁₃	X₁₄	X₁₅	X₁₆	X₁₇	X₁₈	X₁₉	X₂₀	X₂₁	X₂₂	X₂₃	X₂₄	X₂₅	X₂₆
X₁	0.77671	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₂	0.05288	0.77671	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₃	0.05288	0.00049	0.77671	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₄	0.77671	0.00049	0.00159	0.77671	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₅	0.05288	0.00049	0.00159	0.00551	0.77671	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₆	0.05288	0.00049	0.00159	0.00551	0.01024	0.77671	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₇	0.77671	0.00049	0.00159	0.00551	0.01024	0.02546	0.77671	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00017
X₈	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.77671	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₉	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.77671	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₀	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.77671	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₁	0.77671	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.77671	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₂	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.77671	0.77671	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₃	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₄	0.77671	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₅	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₆	0.77671	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₇	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₈	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₁₉	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₂₀	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₂₁	0.77671	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₂₂	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₂₃	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₂₄	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₂₅	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027
X₂₆	0.05288	0.00049	0.00159	0.00551	0.01024	0.02546	0.10680	0.00247	0.00002	0.00441	0.05774	0.00796	0.02149	0.02237	0.01281	0.00173	0.00193	0.00731	0.00698	0.00283	0.00415	0.00671	0.00034	0.00037	0.00142	0.00027

Table 7

Comment on transportation probability matrix

X1 can keep 0.77671 from its exports and

win	from	loss	from
0.05288	X_2	0.00049	X_2
0.05288	X_3	0.00159	X_3
0.05288	X_4	0.00551	X_4
0.05288	X_5	0.01024	X_5
0.05288	X_6	0.02545	X_6
0.05288	X_7	0.0168	X_7
0.05288	X_8	0.00247	X_8
0.05288	X_9	0.00062	X_9
0.05288	X_{10}	0.00441	X_{10}
0.05288	X_{11}	0.05774	X_{11}
0.05288	X_{12}	0.00796	X_{12}
0.05288	X_{13}	0.02149	X_{13}
0.05288	X_{14}	0.02227	X_{14}
0.05288	X_{15}	0.01281	X_{15}
0.05288	X_{16}	0.00173	X_{16}
0.05288	X_{17}	0.00193	X_{17}
0.05288	X_{18}	0.00731	X_{18}
0.05288	X_{19}	0.00698	X_{19}
0.05288	X_{20}	0.00283	X_{20}
0.05288	X_{21}	0.00415	X_{21}
0.05288	X_{21}	0.00415	X_{21}
0.05288	X_{22}	0.00671	X_{22}
0.05288	X_{23}	0.00034	X_{23}
0.05288	X_{24}	0.00037	X_{24}
0.05288	X_{25}	0.00142	X_{25}
0.05288	X_{26}	0.00037	X_{26}

Table 8

Companies quota prediction

Years	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24	X25	X26
2001	0.21641	0.05339	0.0?76	0.0995?	0.03233	0.01488	0.00165	0.01942	0.03554	0.01193	0.03247	0.00161	0.04460	0.0058?	0.01828	0.05394	0.04692	0.00766	0.03280	0.07113	0.00910	0.02153	0.01168	0.02028	0.03436	0.14830
2002	0.21047	0.05043	0.04084	0.03834	0.03933	0.05992	0.01835	0.05336	0.01421	0.00973	0.02465	0.00237	0.02852	0.00831	0.00483	0.00552	0.04500	0.00174	0.03136	0.01213	0.03414	0.08453	0.13135	0.02323	0.05677	0.04245
2003	0.30860	0.12689	0.04722	0.04383	0.06107	0.04110	0.04184	0.0957?	0.00458	0.00823	0.02987	0.00217	0.06446	0.03619	0.00560	0.01796	0.04723	0.02?44	0.03085	0.01446	0.01957	0.03932	0.04714	0.04288	0.02306	0.03915
2004	0.20768	0.08078	0.05742	0.07977	0.03524	0.04563	0.01738	0.01130	0.00507	0.00703	0.04553	0.00211	0.03109	0.03421	0.00520	0.03469	0.09804	0.03601	0.02987	0.03446	0.01328	0.04237	0.04155	0.03025	0.03128	0.04159
2005	0.20835	0.07915	0.06473	0.05411	0.03326	0.05398	0.03334	0.02577	0.00486	0.00626	0.02694	0.00315	0.03360	0.07458	0.00550	0.01729	0.06488	0.02914	0.03977	0.03348	0.01363	0.06965	0.04437	0.02679	0.04461	0.05398
2006	0.21044	0.07905	0.05911	0.05536	0.04513	0.05833	0.03317	0.02516	0.02313	0.00575	0.03699	0.00228	0.05344	0.05073	0.00563	0.03171	0.0635.	0.02694	0.03979	0.06390	0.01311	0.05151	0.05444	0.07724	0.03271	0.24163
2007	0.21369	0.08890	0.05869	0.07086	0.04335	0.05436	0.02440	0.06446	0.00531	0.00536	0.03416	0.00221	0.0?032	0.04999	0.00573	0.02893	0.06386	0.03745	0.02989	0.04571	0.01348	0.05339	0.04503	0.02767	0.03600	0.04177
2008	0.21514	0.08315	0.06697	0.06362	0.06201	0.05419	0.02679	0.03400	0.00526	0.0?.??	0.03433	0.00225	0.04090	0.04989	0.00561	0.02262	0.07109	0.02764	0.02999	0.043.6	0.01258	0.06378	0.04537	0.02708	0.04108	0.04693
2009	0.21804	0.08337	0.06071	0.06395	0.05343	0.05597	0.03048	0.03364	0.00533	0.00495	0.04642	0.00233	0.04936	0.05525	0.00577	0.02447	0.06709	0.03802	0.03028	0.04532	0.01387	0.05883	0.04967	0.02852	0.03709	0.04748
2010	0.22115	0.08777	0.06243	0.07062	0.05299	0.05595	0.02761	0.03376	0.00535	0.00486	0.04025	0.00235	0.04571	0.05339	0.00594	0.02725	0.06735	0.02858	0.03059	0.04946	0.01405	0.05930	0.05023	0.02888	0.03897	0.05685

Table 9			
Final results		The share of	
A_1	0.19148	X_1	0.19148
A_2	0.00177	X_2	0.00177
A_3	0.00576	X_3	0.00576
A_4	0.01995	X_4	0.01995
A_5	0.03708	X_5	0.03708
A_6	0.09219	X_6	0.09219
A_7	0.06083	X_7	0.06083
A_8	0.00894	X_8	0.00894
A_9	0.00007	X_9	0.00007
A_{10}	0.01597	X_{10}	0.01597
A_{11}	0.20907	X_{11}	0.20907
A_{12}	0.02882	X_{12}	0.02882
A_{13}	0.07761	X_{13}	0.07761
A_{14}	0.08064	X_{14}	0.08064
A_{15}	0.04638	X_{15}	0.04638
A_{16}	0.00626	X_{16}	0.00626
A_{17}	0.00699	X_{17}	0.00699
A_{18}	0.02647	X_{18}	0.02647
A_{19}	0.02527	X_{19}	0.02527
A_{20}	0.01025	X_{20}	0.01025
A_{21}	0.01503	X_{21}	0.01503
A_{22}	0.0243	X_{22}	0.0243
A_{23}	0.00123	X_{23}	0.00123
A_{24}	0.00134	X_{24}	0.00134
A_{25}	0.00514	X_{25}	0.00514
A_{26}	0.00096	X_{26}	0.00096

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$A_1=0.77671A_1+0.05288(A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_2=0.72431A_2+0.00049(A_1+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_3=0.72541A_3+0.00159(A_1+A_2+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_4=0.72933A_4+0.00551(A_1+A_2+A_3+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_5=0.73407A_5+0.01024(A_1+A_2+A_3+A_4+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_6=0.74929A_6+0.02546(A_1+A_2+A_3+A_4+A_5+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_7=0.74062A_7+0.0168(A_1+A_2+A_3+A_4+A_5+A_6+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}+$
$A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_8=0.72629A_8+0.00247(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_9=0.72385A_9+0.00002(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{10}=0.72823A_{10}+0.00441(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{11}=0.78157A_{11}+0.05774(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{12}=0.73178A_{12}+0.00796(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{13}=0.74531A_{13}+0.02149(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{14}=0.74609A_{14}+0.02227(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{15}=0.73664A_{15}+0.01281(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{16}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{16}=0.72556A_{16}+0.00173(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{17}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{17}=0.72575A_{17}+0.00193(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{18}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{18}=0.73113A_{18}+0.00731(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{19}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{19}=0.73081A_{19}+0.00698(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}$
$+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{20}=0.72666A_{20}+0.00283(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}$
$+A_{19}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{21}=0.72797A_{21}+0.00415(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}$
$+A_{19}+A_{20}+A_{22}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{22}=0.73053A_{22}+0.00671(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}$
$+A_{19}+A_{20}+A_{21}+A_{23}+A_{24}+A_{25}+A_{26})$

$A_{23}=0.72417A_{23}+0.00034(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}$
$+A_{19}+A_{20}+A_{21}+A_{22}+A_{24}+A_{25}+A_{26})$

$A_{24}=0.72420A_{24}+0.00037(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}$
$+A_{19}+A_{20}+A_{21}+A_{22}+A_{23}+A_{25}+A_{26})$

$A_{25}=0.72524A_{25}+0.00142(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}$
$+A_{19}+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{26})$

$A_{26}=0.72409A_{26}+0.00027(A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}$
$+A_{19}+A_{20}+A_{21}+A_{22}+A_{23}+A_{24}+A_{25})$
$1=A_1+A_2+A_3+A_4+A_5+A_6+A_7+A_8+A_9+A_{10}+A_{11}+A_{12}+A_{13}+A_{14}+A_{15}+A_{16}+A_{17}+A_{18}+A_{19}+A_{20}+A_{21}+A_{22}+A_{23}$
$+A_{24}+A_{25}+A_{26}$

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Appendix

Table 1- Value and percentage of exports without pertolum

Case	88/89 Value	88/89 %	89/90 Value	89/90 %	90/91 Value	90/91 %	91/92 Value	91/92 %	92/93 Value	92/93 %	93/94 Value	93/94 %	94/95 Value	94/95 %
Agricultureal commedity	**413.1**	**22.25**	**407.2**	17.37	**226.0**	11.78	**246.3**	8.93	**198.2**	8.32	**222.2**	12.29	**560.4**	13.96
Cotton	298.6	72.28	220	54.03	83.2	36.81	35.4	14.37	36.8	18.57	84	37.80	306.4	54.68
Rice	5.5	1.33	6.9	1.69	4.5	1.99	33.7	13.68	26.1	13.17	55.2	24.84	63.8	11.38
Potatos	14.7	3.56	15.3	3.76	27.7	12.26	36.7	14.90	19.1	9.64	25.6	11.52	104.4	18.63
Oranges	41.2	9.97	90	22.10	37.9	16.77	53.9	21.88	42.2	21.29	12.9	5.81	17.4	3.10
Other	53.1	12.85	75	18.42	72.7	32.17	86.6	35.16	74	37.34	44.5	20.03	68.4	12.21
Aritifical Commedity	**912.2**	**49.13**	**1270.2**	54.19	**1057.8**	55.15	**1673.6**	60.66	**899.4**	37.73	**970.8**	53.70	**1870.1**	46.60
Waving and spaning	466.1	51.10	635.1	50.00	528.9	50.00	563.8	33.69	449.7	50.00	569.3	58.64	1077.3	57.61
Cotton waving	316.2	34.66	446.2	35.13	318	30.00	828.8	49.52	203.8	22.66	223.7	23.04	480.1	25.6
Cotton clothes	52.9	5.80	58.8	4.63	74.6	7.05	85.6	5.11	65.1	7.24	81.6	8.41	10.2	8.6
Other	77	8.44	130.1	10.24	136.3	12.89	195.4	11.68	180.8	20.10	96.2	9.91	151.5	8.10
Other industries	**531.5**	**28.62**	**666.7**	28.44	**634.2**	33.07	**839.2**	30.42	**1285.9**	53.95	**614.8**	34.01	**1582.5**	39.43
Feed commedity	52.2	9.82	59.6	8.94	85.8	13.53	134.9	16.07	691.9	53.81	109.6	17.83	125.2	7.91
Chimical commedity	144.8	27.24	248	37.20	180.6	28.48	227.5	27.11	109.6	8.52	142.5	23.18	293.2	18.53
Metal industries	280.7	52.81	278.3	41.74	277.9	43.82	360.7	42.98	364	28.31	309.4	50.33	1063.7	67.22
Other	53.8	10.12	80.8	12.12	89.9	14.18	116.1	13.83	120.4	9.36	53.3	8.67	100.4	6.34
Non-distributed commedity	240	12.93	207.2	8.84	527	27.4	236.4	8.57	274.6	11.52	49.1	2.72	57.0	1.44
Total	**1856.8**	**100.00**	**2344.1**	100.00	**1918**	100.00	**2759.1**	100.00	**2383.5**	100.00	**1807.8**	100.00	**4013**	100.00

Table 2

Average share per person from the exports in selected countries in 1995

Country	Exports in million	Number of people in million	The average
Singapore	52627	3	17542.3
Hong Kong	29002	5.8	5000.3
Southern Korea	64837	42.8	1514.9
Toyland	23002	55.8	412.2
Turkey	12959	56.1	230
Egypt	2985	52.1	57.3

Table 3- Shortage of Commercial Balance in Egypt during 1970/94

Years	Export	Index	Ratio	Imports	Index	Ratio		Index	
1975	331.2	100.0	-	342	100.0	-	-10.8	100.0	96.8
1976	343.2	103.6	3.6	399.9	116.9	-16.9	-56.7	525.0	85.8
1977	358.8	108.3	4.7	390.8	114.3	2.7	-32	296.3	91.8
1978	444.2	134.1	25.8	361.1	105.6	8.7	83.1	-769.4	123.0
1979	593.3	179.1	45.0	920.1	269.0	-163.5	-326.8	3025.9	64.5
1980	548.6	165.6	-13.5	1539.3	450.1	-181.1	-990.7	9173.1	35.6
1981	595.4	179.8	14.1	1489.9	435.6	14.4	-894.5	8282.4	40.0
1982	668.4	201.8	22.0	1884.3	551.0	-115.3	-1215.9	11258.3	35.5
1983	679.8	205.3	3.4	2623.2	767.0	-216.1	-1943.4	17994.4	25.9
1984	. 1287.8	388.8	183.6	2686.2	785.4	-18.4	-1398.4	12948.1	47.9
1985	2130.2	643.2	254.3	3402	994.7	-209.3	-1271.8	11775.9	62.6
1986	2262.9	683.2	40.1	6187.4	1809.2	-814.4	-3924.5	36338.0	36.6
1987	2184.1	659.5	-23.8	6354.5	1858.0	-48.9	-4170.4	38614.8	34.4
1988	2250.3	679.4	20.0	7192.7	2103.1	-245.1	-4942.4	45763.0	31.3
1989	2197.9	663.6	-15.8	7536.1	2203.5	-100.4	. -5338.2	49427.8	29.2
1990	2599.9	785.0	121.4	6973.3	2039.0	164.6	-4373.4	40494.4	37.3
1991	2054	620.2	-164.8	8051.4	2354.2	-315.2	-5997.4	55531.5	25.5
1992	3046	919.7	299.5	11357.8	3321.0	-966.8	-8311.8	76961.1	26.8
1993	3994.4	1206.0	286.4	16308.6	4768.6	-1447.6	-12314.2	114020.4	24.5
1994	5734.7	1731.5	525.5	16623.6	4860.7	-92.1	-10888.9	100823.1	34.5
1995	6953.7	2099 5	358.1	24323.2	7258.2	-2397.5	-17869.5	165458.3	28.0
1996	11764.7	3552.1	1452.6	25216.3	7373.2	-114.9	-13451.6	124551.9	46.7
1997	10373.5	3132.1	-420.0	27656	8086.5	-713.4	-17282 5	160023.1	37.5
1998	10595.8	3199.2	67.1	27550	8055.6	31.0	-16954.2	156983.3	38.5
1999	11934.2	3603.3	404.1	32460.6	9491.4	-1435.8	-20526.4	190059.3	36.8

Table 4- Comaprison between production value, added value and exports in 1993/94

Sector	Value		Ratio	Rank	Employees	Relative importance	Rank	Adding value	Relative importance	Rank	Export values	Export quota	Export ratio
Waving and spanning	2615109	1175131	44.9362	6	268259	42.61	1	1776071	23.20	1	1977711	74.12	75.63
Food	5480864	4211589	76.8417	1	97995	15.56	2	1149576	15.02	5	170639	6.40	3.11
Chemical	1912221	1176492	61.5249	3	52530	8.34	6	678606	8.86	6	106791	4.00	5.58
Engineering	3050287	1798521	58.9624	4	69045	10.97	4	1149803	15.02	4	124078	4.65	4.07
Metallic	4908510	3075161	62.6496	2	77817	12.36	3	1539170	20.11	2	144096	5.40	2.94
Heating	3264987	1740953	53.3219	5	63942	10.16	5	1362036	17.79	3	144837	5.43	4.44
Total					629588	10o		7655262	100		2668152	100	

ملخص بحث بعنوان
نموذج احصائى للاداء التصديرى لقطاع الغزل والنسيج والتنبؤ بحصص الشركات باستخدام اسلوب ماركوف

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يتناول البحث مشكلة الصادرات فاذا تعرضنا لاهم ملامح حصيلة الصادرات السلعيه المصريه- بدون النفط- فى ارقام مطلقه سنكشف عن ضآلتها مما يبرز الاهميه للتوجه الى التصدير. كما يلاحظ التدنى الكبير فى متوسط نصيب الفرد فى مصر من حصيلة الصادرات السلعيه- بعد اضافة النفط- عند مقارنته بمتوسط نصيب الفرد فى بعض الدول الناميه الاخرى. ويلاحظ ايضا ان لدينا عجز فى الميزان التجارى واصلاح هذا العجز يبدأ بزيادة الصادرات وخاصة الصادرات السلعيه. وتعتبر صناعة الغزل والنسيج والملابس بالنسبه لمصر احد الدعائم الرئيسيه لاقتصادها القومى والتى تعتمد عليها البلاد فى سد حاجة السوق المحلى من المنسوجات والملابس الى جانب الاسهام فى تنمية الصادرات من الغزل والمنسوجات والملابس.

هذا البحث يهدف الى بناء نموذج احصائى للتنبؤ بصادرات قطاع الغزل والنسيج خلال العشر سنوات المقبله للمساعده فى وضع خطه استراتيجيه لرفع كفاءة الاداء التصديرى لهذا القطاع، ومن ثم محاولة سد العجز فى الميزان التجارى. كما يهدف البحث الى التنبؤ بالانصبه المحتمله لكل شركه من شركات الغزل والنسيج من الصادرات, وتحديد مدى التغير فى نصيب كل شركه بالنسبه للشركات الاخرى المنافسه من عام الى اخر، ودراسة مراكزها التنافسيه خلال العشر سنوات القادمه فى ظل افتراضات معينه وذلك لكى تكون عونا لمتخذى القرار فى قطاع الغزل والنسيج فى مصر لرسم سياسات التسويق المقبله وذلك باستخدام اسلوب ماركوف.

وقد توصل البحث الى ان نظرة شركات الغزل والنسيج لتحليل صادراتها تعتبر نظره خاطئه اذ ان هذة الشركات تنظر الى الزيادة فى صادراتها على انه نجاح لنشاطها وهذا غير صحيح حيث ان نجاح احد الشركات فى تحقيق صادرات جديده لا ينظر اليه الا من خلال اخذ صادرات الشركات الاخرى فى الاعتبار، كما ان هذة الشركات تتنافس فيما بينها لتصدير اكبر قدر ممكن حيث تحاول كل شركه ان تحصل على النصيب الاكبر من حصة السوق، ونظرا لوجود التنافس بين الشركات فأن تزايد نصيب احد الشركات يمثل نقصا فى نصيب الشركات الاخرى، ويوجد اكثر من اسلوب كمى لتحليل صادرات قطاع الغزل والنسيج فى مصر ويعتبر اسلوب ماركوف من انسب الاساليب صلاحيه لهذا التحليل، كما انه يعد تطبيقا حديثا فى مجال قطاع الغزل ونسيج فى مصر.

وانطلاقا من النتائج السابقه فلابد أن تغير شركات الغزل والنسيج وجهة نظرها فى تحليل صادراتها بأن تاخذ كل شركه فى اعتبارها عنصر منافسة الشركات الاخرى لها حتى يُعبر تطور نشاطها عن مدى الاستغلال الحقيقى لامكانياتها الماليه والبشريه على حد سواء، كما أنه يجب على هذة الشركات أن تقوم بالاعتماد على تطبيق الاساليب الكميه فى تحليل صادراتها مثل اسلوب سلاسل ماركوف.