The Thermodynamical Processes of the Model of Ideal Gas for the Description of the Activity of the Microeconomical Systems

Mihai Petrov
Pharmacy "Galantus", 8000, town Bourgas, 8, Al. Bogoridi str., Republic of Bulgaria

Abstract
The activity of the stock markets as a part of microeconomical systems can be described by the ABC analysis and combined with Pareto distribution gives the quantitative description of the marketing activity by the application of the notion of rating coefficients of the stocks and the notion of econophysical temperatures based on these coefficients that have the meaning of the generation power of turnovers per one stock article and they are stabilized with time into a numerical series of Fibonacci numbers for each respective rating groups: ($K_{Ast}=21$, $K_{Bst}=13$, $K_{Cst}=8$, $K_{Xst}=5$, $K_{Zst}=3$). The suggested physical model for the econophysical description of the activity of the markets of stocks is the model of "ideal gas" that is the analogy to the "ideal market". The model of ideal gas is characteristic for the markets of perfect rivals and high competition. The conception of the first and second econophysical microeconomical thermodynamical laws were formulated for the microeconomical systems with the approximation of the turnovers of stocks to the model of ideal gas. Some examples of the market activity were described by isothermal processes and the turnovers could be estimated by the quantitative relation of the work done by the systems at these isoprocesses. The conception of Carnot cycle was applied for the explanation the process of the interaction with the hot reservoir of the market of customers and the cold reservoir of the market of dealers. The process of turnovers is well explained by the principle of work of the Carnot cycle.
Keywords: Econophysical temperatures, Fibonacci numbers, first and second econophysical laws of thermodynamics, Carnot cycle

1. Introduction

The performed ABC analysis with the application of the distribution of Pareto of pharmaceutical systems (VI-th Congress of Pharmacy with International Participation 2016 and III-rd International Conference of Econophysics 2017) serve as the pretext of the application of thermodynamic approximation of the model of ideal gas, due to of the fact that system contains a large variety of articles and wide range of prices of packing products, (thermodynamical systems in econophysics are the systems with big quantities of particles stated by P. Richmond and J. Mimkes 2013), and for small pharmaceutical markets the value of N_{art} is about *~1000* till *~10000* for the big ones and these values will be enough to consider the marketing system as the approximated thermodynamical system (V. Sergeev and A. Tsirlin 2008, 2011). The conception of "ideal gas" in economics can be considered as the analogue of the "ideal market". The model of ideal gas is characteristic for the markets of perfect rival. The following peculiarities are characteristically for the markets of perfect rival:

- the big quantity of active independent firms and customers. They do not depend on each other and are not able to influence on the price of the products;
- the homogeneity of products, so that the supplied products by firms are similar not only by physical properties but also to be of exact composition, so the buyers do not see the difference between the products of various producers;
- the total publicly open information about the situation of the market both for the sellers and the customers.

The following conditions are valid for the perfect markets:

- providing the objective homogeneity of products. They are regarded by the seller and customers as worthy and freely are changed each other;
- personal preferences can not be predominant on the market. All participants on the market have the same rights.

2. Method of determination of generating power of turnovers based on Fibonacci numbers by ABC marketing analysis combined with Pareto distribution

The VI-th Congress of Pharmacy with International Participation [1] and III-rd International Conference of Econophysics presented the information about the rating coefficients of the stocks found by statistical distribution of Pareto (F. Geerolf, 2016) and combined with ABC analysis (C. Caplice, 2006). The respective function of the distribution of Pareto is:

$$F(x) = 1 - (1 - x)^K, \quad 0 < x \leq 1 \tag{1}$$

here x is the relative position of the stock articles. The respective graphic of the function combined with ABC analysis is represented on Figure 1. The rating coefficients of the stocks K (generating power of turnovers) are calculated by Equation (2) for the interval of times from unspecified random first day till several months as of order 72 months.

$$K = \frac{\ln(1 - F(x))}{\ln(1 - x)} \tag{2}$$

These found values of K are arranged on stationary numerical series of the Fibonacci numbers ($K_{Ast}=21$, $K_{Bst}=13$, $K_{Cst}=8$, $K_{Xst}=5$, $K_{Zst}=3$) for the big intervals of time of 72 months. These stationary values represent the average turnovers of the selling that corresponds to one stock article during a day and if these values of average turnovers are divided by the price P_{0j} of one packing product, then it means the result of sold packing products N_{0j} of respective stock article during a day. The index j corresponds to the respective rating group A, B, C, X, Z ($Z \leq j \leq A$). The respective quantity of sold products N_{0j} corresponding to one stock article is represented by Equation (3):

$$N_{oj} = \frac{K_j}{P_{oj}}; Z \leq j \leq A \tag{3}$$

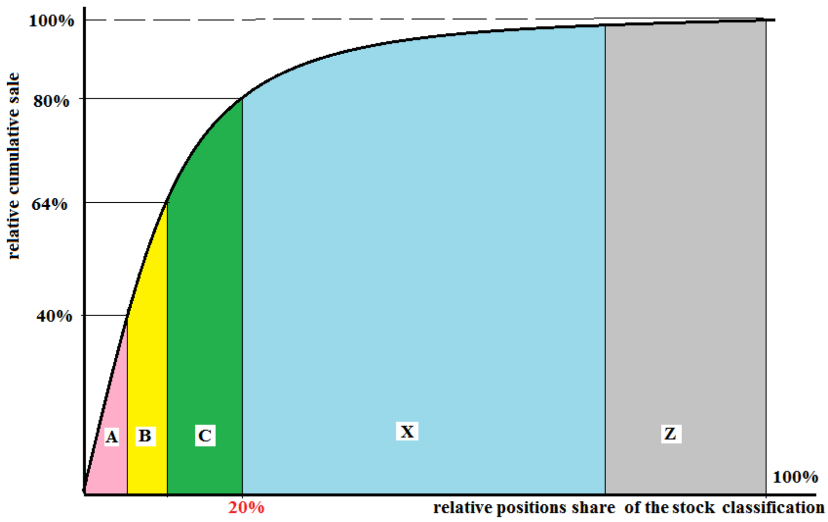

Figure 1. Rating shares of stocks on the diagram of Pareto

The big systems of stocks can be described by average values and the Equation (3) can be rewritten as:

$$< P_j >_{p.p.} = \frac{< K_j >}{< N_{oj} >}; Z \leq j \leq A \tag{4}$$

here $<P_j>_{p.p.}$ is the average price of one packing product

The dependence of the average price $<P_j>_{p.p.}$ of one packing product upon the quantity of products N_{oj} for one stock article according to the Equation (4) is represented schematically on Figure 2: $<P_j>_{p.p}=f(N_{0j})$.

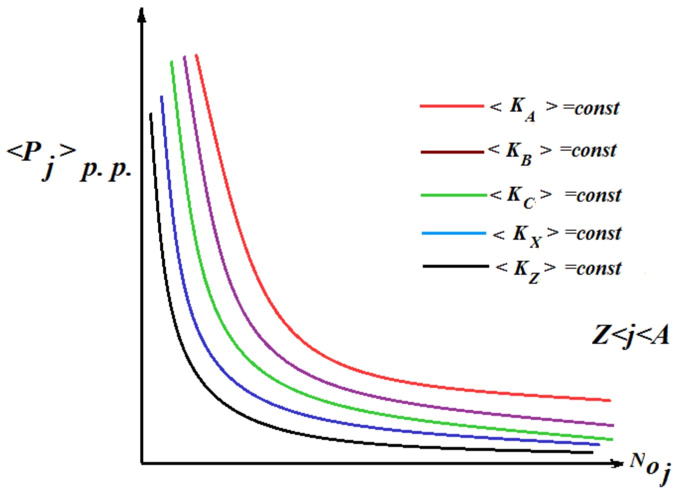

Figure 2. The dependence of average price $<P_j>_{p.p.}$ of one packing product on the quantity of products N_{0j} for one stock article

This graphic from the Figure 2 has a very good analogy to the graphic of the dependence of the pressure of the gas upon the volume of gas at isothermal process (*T=const*) (V. Sergeev, 2008) The quantity of packing products N_{oj} is similar to the macroscopical thermodynamical parameter *V* - volume of the gas. The value $<P_j>_{p.p.}$ is similar to the another macroscopical thermodynamical parameter of ideal gas *P*- pressure of the gas. The macroscopical parameters of ideal gas are: temperature, volume and the pressure. The analogical parameters of the market in general are: prices, quantity of products and the incomes. (Table 1).

TABLE 1. Analogy of microeconomical parameters to econophysical ones for the A, B, C, X, Z marketing subgroups

Sign of parameters; ($Z<j<A$)	Microeconomical parameters	Econophysical (physical) analogy of parameters
$<P_j>_{p.p.}$	Price of one packing product	Pressure of gas
N_{0j}	Amounts of products of one stock article	Volume of gas
K_j	Turnovers per one stock article (item)	Temperature of the gas

These parameters describe the possibility of economic equilibrium by thermodynamical approximation with the application of model of ideal gas (V. Sergeev, 2008) and this equation is:

$$PV = NT \tag{5}$$

here *N* is the amount of customers (buyers); *T* is the economic temperature of the market of buyers. This economic temperature is related to the average income from one buyer. One moment is important to mention from this reference (V. Sergeev, 2008) that the product of *P* and *V* receives maximal possible value $<K_j>$ and with the consideration of the Equation (5), then such equation can be written:

$$< P_j >_{p.p.} N_{oj} = N \cdot T =< K_j >; \quad A \le j \le Z \tag{6}$$

Considering the amount of articles N_{artj}, and the product $N_{oj} N_{art\,j} = N_{tot\,j}$ then the Equation (6) can be written as:

$$< P_j >_{p.p.} N_{tot_j} =< K_j > N_{art_j} \tag{7}$$

The Equation (7) could be named as the equation of the state of microeconomical systems.

3. Results of ABC analysis at possible great interval of time

The results of the performing of ABC analysis is represented as the diagram on the Figure 3.

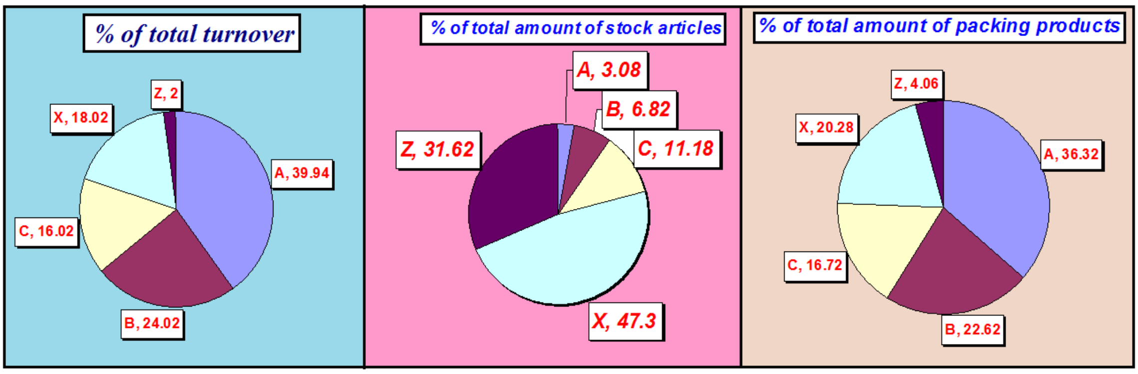

Figure 3. The graphical presentation of the results of ABC analysis at possible great interval of time: 72 months

The moment of time when the ratio 20/80 of the principle of Pareto takes place in general was solved in the report of the VI-th Congress of Pharmacy and this one is of order 72 months and the respective numerical values of the rating coefficients for this moment of time are: ($K_{Ast}=21$, $K_{Bst}=13$, $K_{Cst}=8$, $K_{Xst}=5$, $K_{Zst}=3$). It can be seen from the Figure 3 that at possible great interval of time (as of order 72 months) the total turnover of ABC group consists 80% that demonstrates the statements of Pareto distribution. The distribution of the prices of packing products as a function of demanded amounts represented on Figure 4 has the analogy with the curves of the ideal gas that is represented on the Figure 2.

4. The conception of first econophysical microeconomical thermodynamical law

So, the "ideal market" is approximated to the system of ideal gas and the state of ideal gas is described by three macroscopical parameters N_{oj} ; $<K_j>$; $<P_j>_{p.p.}$. The equation of the state of ideal gas is equivalent to the found equation of supply - demand process:

$$N_{totj} < P_j >_{p.p.} = K_j N_{artj}; \quad Z \le j < A \tag{8}$$

So, this Equation (8) is the equation of Mendeleev - Clapeyron of the state of ideal gas adjusted to the microeconomical system. The total quantity of packing products of the rating group j is: $N_{oj} N_{art\,j} = N_{tot\,j}$; N_{oj} is the quantity of packing products for one stock article; $N_{art\,j}$ is the quantity of stock articles of the respective rating group.

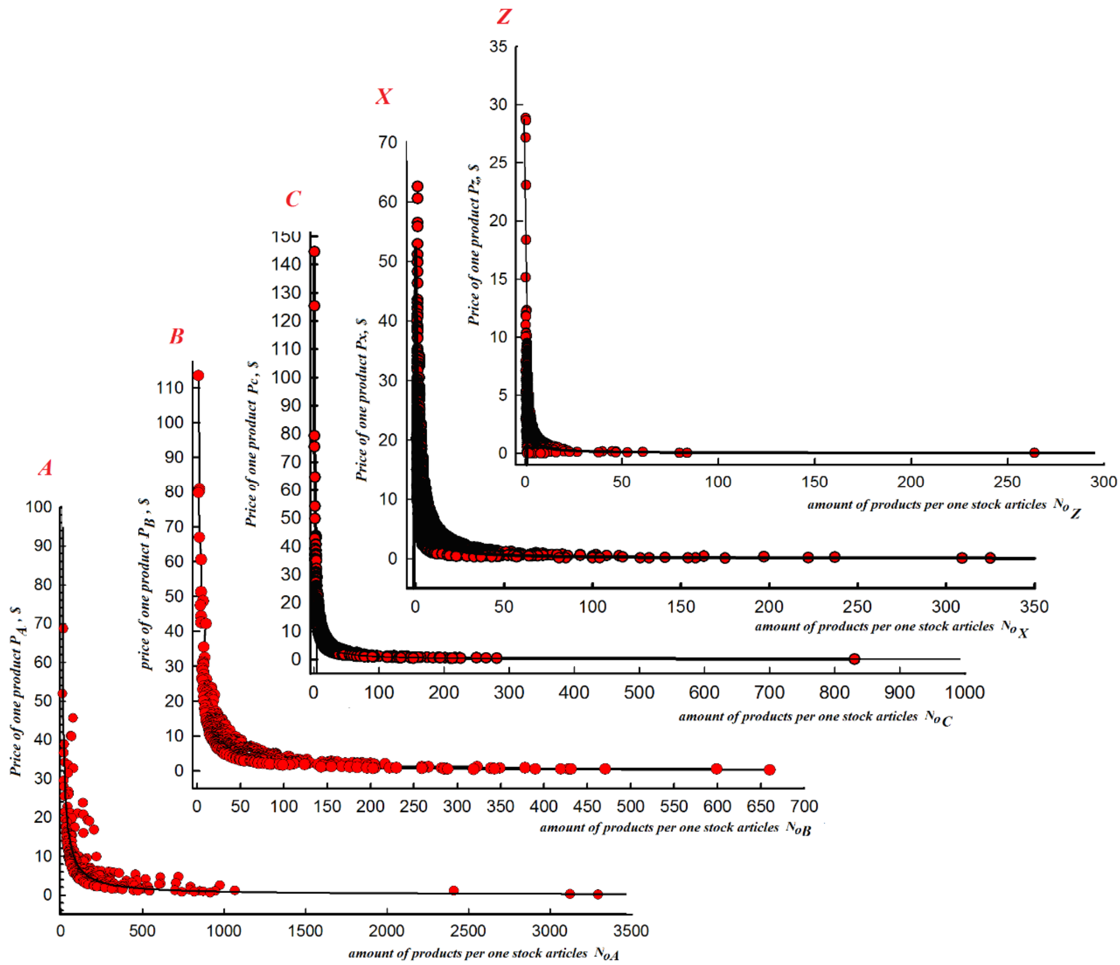

Figure 4. Curves of demanded products for each respective rating groups at the great possible interval of time 72 months

The notion of energy in econophysics is related to money, incomes, turnovers (J. Mimkes, 2013, V. Sergeev, 2008, A. Tsirlin, 2011). The variation of internal energy ΔU of this system is the variation of stock reserve (inventory). The internal energy ΔU of this system consists of the energies of the molecules of the gas that consists this system. According to ABC marketing analysis, there are five types of molecules A, B, C, X, Z corresponding to the respective rating groups and this system simply is considered as a mixture of gases. According to the law of Dalton of the mixture of gases, the total pressure is equal to the sum of all partial pressures of the individual gases. The law of Dalton adjusted by the notions of marketing groups is:

$$< P_A >_{p.p.} \cdot N_{totA} + < P_B >_{p.p.} \cdot N_{totB} + < P_C >_{p.p.} \cdot N_{totC} + < P_X >_{p.p.} \cdot N_{totX} + < P_Z > \cdot N_{totZ} \quad (9)$$

So, the econophysical formulation of Dalton law is: the total inventory (stock) is the sum of partial inventories of the respective rating groups. The econophysical temperature K_{ABCXZ} of the full mixture can be found from the law of Dalton with the consideration that each term in the Equation (9) is equal to $K_j N_{artj}$ and then:

$$K_A N_{artA} + K_B N_{artB} + K_C N_{artC} + K_X N_{artX} + K_Z N_{artZ} = K_{ABCXZ} N_{totArt} \quad (10)$$

The total amount of the stock articles of the system is $N_{totArt} = N_{artA} + N_{artB} + N_{artC} + N_{artX} + N_{artZ}$ and with the consideration of the results of ABC analysis that are represented on Figure 3, the shares of articles of the respective rating groups are:

$$N_{art_A} = 0.03 N_{totArt};\ N_{art_B} = 0.06 N_{totArt};\ N_{art_C} = 0.11 N_{totArt};\ N_{art_X} = 0.48 N_{totArt};\ N_{art_Z} = 0.32 N_{totArt} \quad (11)$$

Then with the considerations of the Equations (10) and (11) the final result of econophysical temperature K_{ABCXZ} is written as:

$$K_{ABCXZ} = 0.03K_A + 0.06K_B + 0.11K_C + 0.48K_x + 0.32K_Z \quad (12)$$

The found econophysical temperatures of the separated components are the Fibonacci numbers:

$$K_A=21;K_B=13;K_C=8;K_X=5;K_Z=3 \quad (13)$$

$$K_{ABCXZ} = 0.03\cdot 21 + 0.06\cdot 13 + 0.11\cdot 8 + 0.48\cdot 5 + 0.32\cdot 3 = 0.63 + 0.78 + 0.88 + 2.4 + 0.96 = 5.65 \quad (14)$$

So, the economical temperature of this mixture of gases is $K_{ABCXZ}=5.65$ that coincides with the value found by numerical method of Pareto distribution and it means the generating power of turnover of the average statistical stock article of entire system during a day. This value $K_{ABCXZ}=5.65$ is also named the econophysical temperature of statistical ensemble of the stocks. According to the first lawof thermodynamics, the state of the system is changed if the heating ΔQ is transferred to this system. From econophysical point of view, the heating ΔQ is the torrents of buyers. So, the formulation of first law of thermodynamics can be staed as: The change of the internal energy ΔU of a system is equal to the net energy added as the heat ΔQ to the system, minus the net work ΔW done by the system:

$$\Delta U = \Delta Q - \Delta W \quad (15)$$

The respective formulation of econophysical first law of microeconomical thermodynamics is: The change of the inventory ΔU of microeconomical system is equal to the torrents of buyers ΔQ minus the produced turnover ΔW of this microeconomical system. More logical general definition of econophysical first law of microeconomical thermodynamics can be formulated as: The energy of the torrents of buyers ΔQ transmitted to the microeconomical system leads to the change of the inventory with value ΔU and the producing of turnover ΔW of this microeconomical system. More simply could be reformulated as: Money paid from customers ΔQ equals to the change of the stocks with the value ΔU plus the money from the turnovers ΔW. As the reserve of internal energy U is limited, then the process is impossible for systems to perform the work without the input of external energy that it is not possible the existence of permanent perpetual motion machine of first kind. As the internal energy U is related to the stock, then the reserve of stocks is limited and the work is impossible to be performed without new stocks from dealers. The equivalent econophysical formulation of first law of thermodynamics is the impossibility of the existence of any permanent economical perpetual motion machine of first kind, that performs the work without consumption of stocks from external source. The change of internal energy of the system is:

$$dU = \delta Q - < P_j >_{p.p.} dN_{tot_j} \quad (16)$$

where δQ denotes the infinitesimal amount of heat (this infinitesimal amount is one buyer) supplied to the system from buyers. The work done by the system is $\delta W = <P_j> dN_{totj}$ that means the turnover but the work done upon the system $\delta W' = - <P_j> dN_{totj} = - \delta W$ is nothing else but the request of new stocks from the dealers. So: $\delta W' = - \delta W$. An isothermal process occurs at a constant econophysical temperature ($K=const$). The curve of isotherm is presented on the Figure 5. The work that is done by the microeconomical system is:

$$\Delta W_{j_{K_j=const}} = \int_{N_{tot\,j1}}^{N_{tot\,j2}} < P_j >_{p.p.} dN_{tot_j} = \int_{N_{tot\,j1}}^{N_{tot\,j2}} \frac{K_j N_{art_j}}{N_{tot_j}} dN_{totj} = K_j N_{art_j} \ln N_{totj} \Big|_{N_{totj1}}^{N_{tot\,j2}} = K_j N_{artj} \ln \frac{N_{totj_2}}{N_{totj_1}} \quad (17)$$

What about the value of N_{totj1}? This is an uncertainty because all theoretical models in physics have approximations. For example, the equation of Mendeleev-Clapeyron also is an approximation for the model of ideal gas. The uncertainty, is that for $T=0\ K$ the other two parameters P or V must be zero. The value N_{totj1} is logically to be zero but the applied model of isothermal process related to the equation of Mendeleev-Clapeyron will give the uncertainty like $ln0 = -\infty$. Simply, we will consider that the smallest volume is limited to one packing product $N_{totj1} = 1$, and therefore $\ln N_{totj1} = \ln 1 = 0$. Then we have that:

$$\Delta W_{j_{K_j=const}} = K_j N_{artj} \ln \frac{N_{totj_2}}{N_{totj_1}} = K_j N_{artj} \ln N_{totj_2} \quad (18)$$

If we compare the expression of the turnover of the Equation (18) with that of physical thermodynamics: $\Delta W = n\cdot R\cdot T\cdot ln(V_f/V_i)$; where n - number of moles; R - universal constant of gases, then $N_{art} \equiv n\cdot R$.

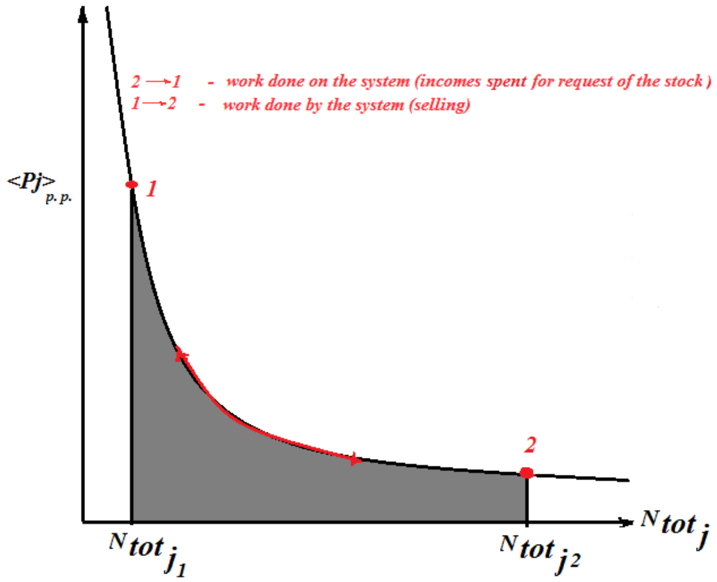

Figure 5. The curve of isotherm and the calculation of the work (area under the curve)

5. The application of the first law of thermodynamics to various examples of microeconomical systems

The Equation (18) of the estimation of turnovers during a day can be applied for various microeconomical systems and the calculated turnovers by this Equation (18) could be compared with the average real data. It is important to mention that for the description of the microeconomical system is necessary to take into consideration the average amount of sold articles per day and the average amount of packing products during a day that are all based on the statistical processing of the data bases and these data will serve as an criteria of the calculation of the turnovers during a day. For example we know that one pharmacy could sell during a day several seventy stock articles and three hundred packing products and these data are approximately the same data for the request of new stocks from dealers and this list of products serve as the offering starting list of the day for the customers. Another systems that are referring directly to the persons like hair-dressing salons, then this salon could offer as the starting list of the day as twenty various hair style and the starting list of twenty persons during a day that are early registered. Each of the systems have their specification of the activity and well known offered services.

Another peculiarity is important to mention that for the value $N=1$ the natural logarithm is zero and the respective value of turnover is zero. The model is an approximation and therefore just this formalism is mentioned below considering that $1+x \approx x$ for very big values of x and just the Equation (18) can be written as: $\Delta W = K \cdot N_{art} \cdot \ln(N+1)$

In the case when we have no selling $(N=0)$ then the turnover is zero: $\Delta W = K \cdot N_{art} \cdot \ln(0+1) = 0$

Below some examples of various systems are described considering the econophysical temperatures of the mixture of "gases" as $K_{ABCXZ}=K=5.65$ and the data bases are compared with those published on various sources of websites and magazines. Instead of N_{tot} a simply symbol N can be used. The calculated values of turnovers are possible for all national currencies and therefore simply specification of currencies will not be written

5.1 Pharmacies

It depends on the size of the pharmacy and the quantities of articles of products. The average annual revenue is about 300000$ till 800000 $ and more till 2000000$ depending on a lot of factors: place, population, politics of stocks. The value $N_{art}=70$ is the average quantity of sold articles per day that can be equal or more than the average start items requested from the dealers. During a day the sold products could be $N\approx 500$ packing products. Then the calculation of the work (the turnover) is:

$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 70\cdot \ln 501=5.65\cdot 70\cdot 6.21\approx 2450$

$\Delta W_{month}=2450\cdot 30=73500;\quad \Delta W_{year}=73500\cdot 12=882000$

The obtained values satisfy the interval of turnovers represented in the above mentioned website.

5.2 The supermarkets of foods

The annual average revenue is about ~ 20 millions $ (www.statista.com/average sales per store). The value $N_{art}=1000$ - average quantity of various different names of articles sold per day. During the day the sold products could be $N\approx 50000$ packing products. Then the calculation of the turnover is:

$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 1000\cdot \ln 50001=5.65\cdot 1000\cdot 10.82\approx 61200$

$\Delta W_{month}=61200 \cdot 30 = 1836000; \quad \Delta W_{year}=1836000 \cdot 12 \approx 22000000$

This value satisfies the data presented in (www.statista.com/average sales per store).

5.3 The restaurants and fast foods

It varies depending on the type and services of these restaurants and the turnovers are within 400000 $ and 4 millions $ during a year (Taylor K. 2016) and stock articles are within *~20* and *~100*. The quantity of consumed food per day is about 300 kg. The demanded average stock articles could be about 80 during one day. Then the average estimation of turnovers during a day for the restaurants and fast food is:

$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 80 \cdot \ln 301=5.65 \cdot 80 \cdot 5.7 \approx 2580$

$\Delta W_{month}=2580 \cdot 30 \approx 77400; \quad \Delta W_{year}=77400 \cdot 12 \approx 930000$

The obtained value satisfies the interval of turnovers during one year represented in the above mentioned website.

5.4 Small shops of clothes

It depends on the price points of the clothing being sold and varies annually from $25000 to $500000 (Wong K. 2017). The demand amount of articles for the small shop of clothes could be N_{art} = 20. During a day the sold products could be $N=100$. Then the calculation of the turnover is:

$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 20 \cdot \ln 101=5.65 \cdot 20 \cdot 4.6 \approx 500$

$\Delta W_{month}=500 \cdot 30 = 15000; \quad \Delta W_{year}=15000 \cdot 12=180000$

The obtained value satisfies the results during one year represented in the above mentioned website.

5.5 Minimarkets of foods

The average annual turnover is $600000 (Wells J. 2017). The demand amount of articles for the small shop of foods could be $N_{art}=50$. During a day the sold products could be $N=600$. Then the calculation of the turnover is:

$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 50 \cdot \ln 601=5.65 \cdot 50 \cdot 6.39 \approx 1800$

$\Delta W_{month}=1800 \cdot 30 = 54000; \quad \Delta W_{year}=54000 \cdot 12 \approx 650000$

The obtained values satisfy the interval of turnovers represented in the above mentioned website.

5.6 The super markets of fashion clothes

The value $N_{art}=400$ is the average quantity of stock articles names sold per day (Hossain S. 2016). During a day the sold products could be $N=500$. Then the calculation of the turnover is:

$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 400 \cdot \ln 501=5.65 \cdot 400 \cdot 6.21 \approx 14000$

$\Delta W_{month}=14000 \cdot 30 = 420000; \quad \Delta W_{year}=420000 \cdot 12 \approx 5000000$

The obtained values satisfy the interval of turnovers represented in the above mentioned website.

5.7 Petrol stations

The average turnover is $700000-$3000000 each month (Rating S. 2017). The value $N_{art}=100$ - (various types of liquid fuel and gas fuel, various technical oils) and considering 5-6 ranks of suppliers, then $N_{art}=600$ (Sector study on petrol station market, 2007). During the day the sold products could be $N=30000$ liters of fuel per day. Then the calculation of the turnover is:

$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 600 \cdot \ln 30001=5.65 \cdot 600 \cdot 10.3 \approx 35000$

$\Delta W_{month}=35000 \cdot 30 \approx 1000000; \quad \Delta W_{year}=1000000 \cdot 12 \approx 12000000$

The obtained values satisfy the interval of turnovers represented in the above mentioned website.

5.8 Hotel services

There are 15000 rooms per year that are booked by clients (Jones M. 2013). It means that N =60 rooms could be booked averagely per day. The value $N_{art} \approx 7$ - various types of rooms with various sizes and various commodities. Considering a hotel with twenty floors then the total number of varieties is $N_{art}=140$. A lot of hotels contains restaurants inside and therefore the total turnover per day consists of two parts:

1. Turnover of the booking of the rooms; 2. Turnover of the restaurant.

1. The turnover of the booking of the rooms: $\Delta W_1=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 140 \cdot \ln 61=5.65 \cdot 140 \cdot 4.09 \approx 3300$

2. The turnover of the restaurant includes $N_{art} \approx 80$ various types of food and drink per day. The total quantity could reach 300 kg and the turnover: $\Delta W_2=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 80 \cdot \ln 301=5.65 \cdot 80 \cdot 5.7 \approx 2600$

The turnover per year is: $\Delta W_{year1}=3300 \cdot 30 \cdot 12 \approx 1000000; \quad \Delta W_{year2}=2600 \cdot 30 \cdot 12 \approx 900000$

The total turnover of the hotel is: $\Delta W_{year}=\Delta W_{year1}+\Delta W_{year2}=1900000$

5.9 Currency exchange offices

The average revenue is about 76000 $ montly per on currency exchange office is presented as a information in (www.pariteni.bg/currencies). The value is $N_{art}=35$ - various national currencies. Each national currency is provided by 10000$ minimum for the ability to change the respective national currency. Therefore, every day is

necessary to have the initial total sum balance 350000$ (or 10000$ initial balance for the each national currency), then $N=350000$
$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 35\cdot \ln 350001=5.65\cdot 35\cdot 12.76 \approx 2500$
$\Delta W_{month}=2500\cdot 30 =75000$; $\Delta W_{year}=75000\cdot 12 = 900000$

5.10 Theaters and cinema
The maximum revenue of one theater or cinema is USD 280000 monthly. (Arpa S. 2018). The program could have film shows or other cultural events with possibility maximum seating for 350–400 seats, but could be only 80% occupied from all seats, therefore $N_{art} =250$ and the respective average amount of persons per day visiting the theater could be of order $N=250$ for one show. The program during a day could contains three shows and the total amount is $N=750$. Then the turnover is:
$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 250\cdot \ln 751=5.65\cdot 250\cdot 6.62 \approx 9400$
$\Delta W_{month}=9400\cdot 30 \approx 280000$; $\Delta W_{year}=280000\cdot 12 \approx 3400000$

5.11 Shops of the books
The maximum revenue of one book shop is 900000 $ annually (Lazzari Z. 2018). There are a large variety of books of various topics: : scientifical, artistical, stories, historical, Satire, Drama, Action and Adventure, Romance, Mystery, Health, Guide Travel, Children's, Religion, Spirituality, Poetry, Encyclopedias, Dictionaries, Comics, Art, Cookbooks, Journals, Biographies, Autobiographies, Fantasy, etc., so totally is about N_{art}=70 types. During the day the sold books could be $N=500$. Then the calculation of the work is:
$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 70\cdot \ln 501=5.65\cdot 70\cdot 6.21 \approx 2500$
$\Delta W_{month}=2500\cdot 30 \approx 75000$; $\Delta W_{year}=75000\cdot 12 \approx 900000$

5.12 Minishop of fruits and vegetables
The maximum revenue of one such shop is 800000 $ annually (H. Stewart *et al*.). Such shops provides a large variety of vegetables and fruits N_{art}=70. Maximum per day of the selling in kilograms is about 700-800 kg fruits and vegetables and the value $N=800$.
$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 70\cdot \ln 801=5.65\cdot 70\cdot 6.68 \approx 2600$
$\Delta W_{month}=2600\cdot 30 \approx 78000$; $\Delta W_{year}=78000\cdot 12 \approx 940000$

5.13 Stomatological cabinets
The average annual revenue of one stomatological cabinet is about 300000$ ("Dental examiners procedures manual"). There are a lot of procedures corresponding to tooth health state [20] like amalgam and composite fillings, teeth cleanings, cosmetic dentistry, root canals, sealants, oral surgery, gum disease treatment, TMJ therapy, pediatric dentistry, orthodontics, tobacco cessation and nutrition counseling, crowns and bridges, dentures, and dental implants, etc. totally are fifty procedures: N_{art}=50. The number of examined persons per day could reach 20.
$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 50\cdot \ln 21=5.65\cdot 50\cdot 2.99 \approx 850$
$\Delta W_{month}=850\cdot 30=25500$; $\Delta W_{year}=25500\cdot 12 \approx 300000$

5.14 Medical laboratories
The average annual revenue of one medical laboratory is about 4000000$ (https://csimarket.com/Industry/"Medical laboratories industry"). The analysis of laboratory consists of following parts: Cholesterol tests, STD testing, HIV testing, Blood culture tests, Thyroid and hormone tests, glucose test, enzymes test, urine test, etc. Totally they are: N_{art}=300. The number of of examined persons or the tests per day could reach $N=500$ (Drancourt M. *et al.* 2016).
$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 300\cdot \ln 501=5.65\cdot 300\cdot 6.21 \approx 10530$
$\Delta W_{month}=10530\cdot 30=315900$; $\Delta W_{year}=315900\cdot 12 \approx 3800000$

5.15 Cosmetical shops
It depends on the size of this shop and the quantities of articles of products. The average annual revenue is about 800000 $ (www.statista.com/stats/cosmetics). The value $N_{art}=70$ - average quantity of stock articles names sold per day. During the day the sold products could be $N=300$. Then the calculation of the work is:
$\Delta W=K\cdot N_{art}\cdot \ln(N+1)=5.65\cdot 70\cdot \ln 301=5.65\cdot 70\cdot 5.7 \approx 2200$
$\Delta W_{month}=2200\cdot 30=66000$; $\Delta W_{year}=66000\cdot 12 \approx 800000$

5.16 Small hair-dressing salons
It depends on the size of this shop and the quantities of articles of products (Yara G. 2018). The average annual revenue is about 100000 till 300000 $. The visitors per day could reach 25, and the types of services could be $N_{art}=20$.

$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 20 \cdot \ln 26=5.65 \cdot 20 \cdot 3.21 \approx 360$
$\Delta W_{month}=360 \cdot 30=10800; \quad \Delta W_{year}=10800 \cdot 12 \approx 130000$

5.17 Shops of computers and laptops
The average monthly turnover is about 250000 $ (www.statista.com/statistics/272595/global-shipments-forecast-for-tablets-laptops). There are several 50 types of computers and laptops, 20 types and accessories for computers, 10 types of CD, DVD, and flash drives, papers, office papers, notebooks, printers, scanners, etc. , totally $N_{art}=500$. The amount of selling could reach $N=20$.
$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 500 \cdot \ln 21=5.65 \cdot 500 \cdot 2.99 \approx 8400$
$\Delta W_{month}=8400 \cdot 30=252000; \quad \Delta W_{year}=252000 \cdot 12 \approx 3000000$

5.18 Estate agencies
The information of the selling in different magazines and newspaper are of order N_{art} =15000 every day (http://investbg.government.bg/files/investment catalogue.pdf). One real estate agency represented by brokers has the possibility to sell one home during one week (www.dailymail.co.uk/news/property market struggles.html) then referring to one day it means $(N=1/7)$.
$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 15000 \cdot \ln(1+1/7)=5.65 \cdot 15000 \cdot 0.1334 \approx 11300$
$\Delta W_{month}=11300 \cdot 30=339000; \quad \Delta W_{year}=339000 \cdot 12 \approx 4000000$

5.19 Car dealership
The different types of cars are represented in (www.carmax.com/cars): Wan, jeep, wagon, coupe, pick up, etc. The full data base contains the amount like $N_{art} \approx 2000$ (www.statista.com/statistics/automobile markets). During a day one car could be sold ($N=1$).
$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 2000 \cdot \ln(1+1)=5.65 \cdot 2000 \cdot 0.0.69 \approx 7800$
$\Delta W_{month}=7800 \cdot 30=234000; \quad \Delta W_{year}=234000 \cdot 12 \approx 2800000$

5.20 Car parking
The average annual revenue is about 1000000$ (https://howtostartanllc.com/business-ideas/"how to start a parking lot business"). The sizes of parking could be various. For example four ranks with 30 places, then totally amount of the places could be $N_{art} \approx 120$. During a day the places could be occupied till 80 % It means $N \approx 100$.
$\Delta W=K \cdot N_{art} \cdot \ln(N+1)=5.65 \cdot 120 \cdot \ln(1+100)=5.65 \cdot 120 \cdot 4.61 \approx 3100$
$\Delta W_{month}=3100 \cdot 30=93000; \quad \Delta W_{year}=93000 \cdot 12 \approx 1200000$
The list about the systems could be continued with other various activities but this is not the strictly purpose of this paper. It is important that the above list includes a large varieties of various activities with various amounts of services and volumes of them from small amounts till the big ones. The systems described above could be represented in the Table 2.

Table 2. The revenues of various microeconomical systems and the calculated ones by thermodynamical method

Type of activity	N_{art}	**Real data**	**Thermod. Method**	**Thermod. Method**	**Real data**	**N, per day**	$N_{art}\cdot\ln(N+1)$
		W month, $	**W month, $**	**W th.day, $**	**W_r, $ day**		
Supermarkets of foods	1000	2000000	2000000	66667	66666.67	50000	10819.79
Petrol stations	600	1000000	1000000	33333	33333.33	30000	6185.39
Minishops of fruits and vegetables	70	80000	78000	2600	2666.67	800	468.01
Theatres and cinemas	250	280000	282000	9400	9333.33	750	1655.35
Minimarkets of foods	50	55000	54000	1800	1833.33	600	319.92
Supermarkets of fashion clothes	400	400000	420000	14000	13333.33	500	2486.64
Medical laboratory	300	300000	315900	10530	10000.00	500	1864.98
Shops of books	70	80000	75000	2500	2666.67	500	435.16
Pharmacy	70	73000	73500	2450	2433.33	500	435.16
Hotel services	220	167000	160000	5333	5566.67	360	1295.55
Restaurants	80	80000	77400	2580	2666.67	300	456.56
Cosmetical shops	70	67000	66000	2200	2233.33	300	399.49
Car parking	120	83333	93000	3100	2777.77	100	553.81
small shops of clothes	20	15000	15000	500	500.00	100	92.30
Hair-dressing salons	20	10800	10000	333.3	360.00	25	65.16
Shop of laptops	500	250000	252000	8400	8333.33	20	1522.26
Dentist cabinet	50	25000	25500	850	833.33	20	152.22
Car dealership	2000	370000	369000	12300	12333.33	2	2197.22
Estate agency	15000	340000	339000	11300	11333.33	0.142	1991.71

The data of the Table 2 could be represented on the following histogram on Figure 6. The heights are almost the same both for the real data and for the thermodynamical method.

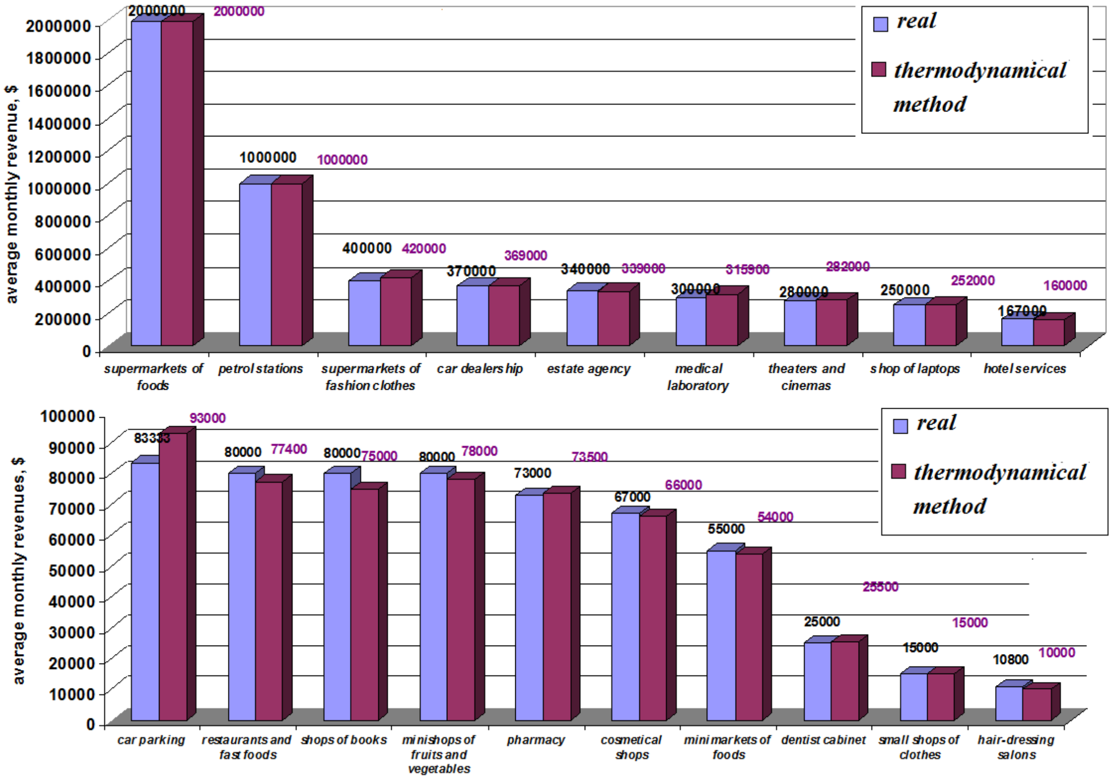

Figure 6. The histogram of real revenues of microeconomical systems and the calculated revenues by thermodynamical method

The real data of the whole world are also shown in Global Bank consumption Data Base and the respective circular diagram is represented on the Figure 7. (http://datatopics.worldbank.org/consumption/"Global consumption Data Base").

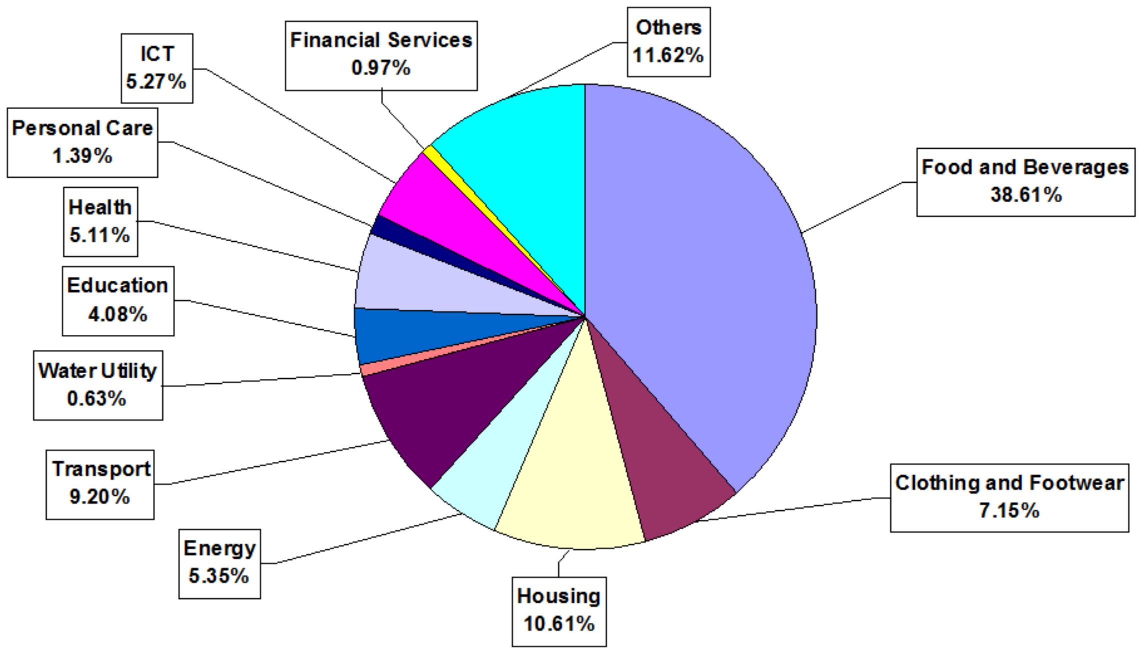

Figure 7. The diagram of global consumption data base

The similar circular diagram is represented on the Figure 8 for the data of the Table 2 that are calculated by thermodynamical method. The data that are represented on the circular diagram of the Figure 8 are almost the same as the real ones from the global consumption database and the small deviations of both data are presented on the Table 3.

Table 3. The comparison of the data of global consumption data base with that ones calculated by thermodynamical method

Type of expenses	Real data	Calculation by thermod. method	Average result	Deviation	Relative error, %
Food	38.61%	35.06%	36.84%	0.01775	4.81%
Clothes	7.15%	7.36%	7.26%	0.00105	1.44%
Personal care (Pharmacy)	1.39%	1.29%	1.34%	0.0005	3.73%
Health (medical laboratory)	5.11%	5.54%	5.33%	0.00215	4.03%
ICT (computers and laptops)	5.27%	4.42%	4.85%	0.00425	8.77%

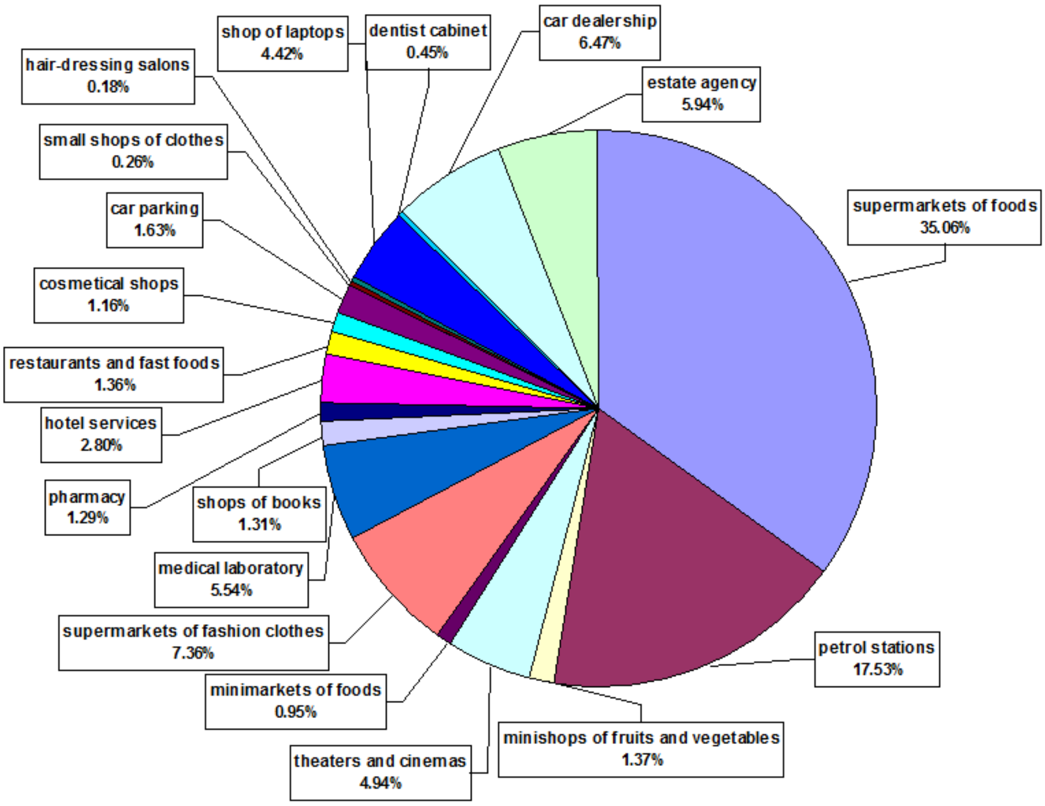

Figure 8. The diagram of the data calculated by thermodynamical method

All these analyses show that there are not any doubts about the fairness of this thermodynamical method that gives the possibility to estimate the turnovers (revenues) by the final formula:

$$\Delta W = K \cdot N_{art} \cdot \ln(N+1) \quad (19)$$

It would be better to check the fairness of this thermodynamical method by the representation of the dependence of $\Delta W=f(N_{art}\cdot ln(N+1))$ in the (Figure 9) and the slope of this dependence will give the value of *K*. The values of $N_{art}\cdot ln(N+1)$ are calculated and are represented on the Table 2.

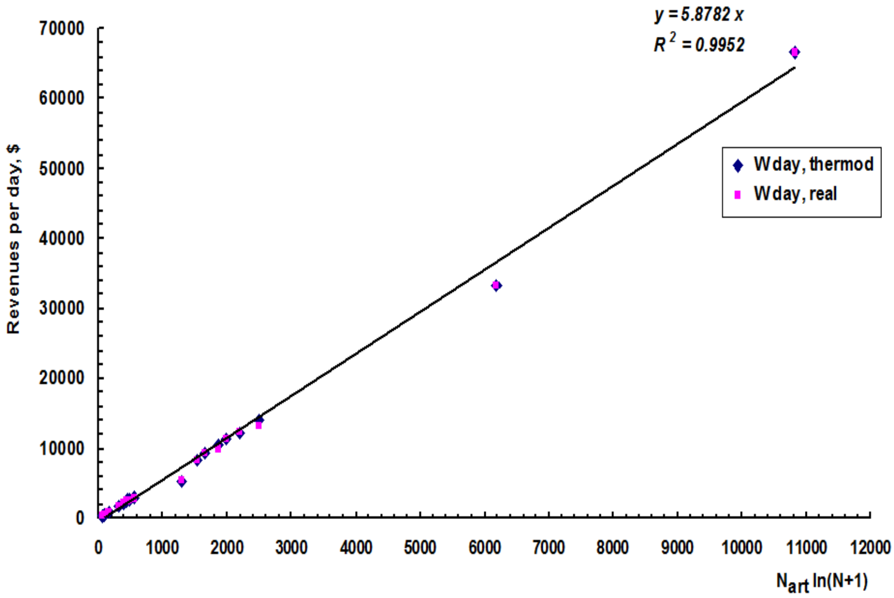

Figure 9. The validation of the thermodynamical method by the dependence $\Delta W=f(N_{art}\cdot ln(N+1))$

In order to check the degree of the fairness of this thermodynamical method it is necessary also to represent the real data on the graphic beside the calculated ones. The data are almost arranged on the straight line and the correlation coefficient is 0.9952, that denotes the validation of the method and the validation of the expression of the work $\Delta W=K\cdot N_{art}\cdot ln(N+1)$. The slope of this linear dependence has the value $K=5.8782$ that is almost the same to that calculated value by the Equation 14.

6. The conception of second econophysical microeconomical thermodynamical law

We know from physics that the second law of thermodynamics allow to conclude about the directions of processes that can take place in reality. The pioneer of the creation of second law of thermodynamics is French scientist and engineer Carnot. He has deduced the formula of efficiency of heat engine:

$$\eta=\frac{\Delta Q_1-\Delta Q_2}{\Delta Q_1} \tag{20}$$

The term η shows the part of heat that is consumed for the work from initial quantity of heat. ΔQ_1-the heat of hot reservoir, ΔQ_2-the heat of cold reservoir. Referring to microeconomical system it means what part of money is consumed for the business activity from initial sum of money paid from buyers. A question could be formulated like: is it possible to perform a such periodical heat engine without cold reservoir ($\Delta Q_2=0$) with the result of efficiency $\eta=1$? Such engine could transform all quantity ΔQ_1 into the work only with one hot reservoir. The scientist Wilhelm Ostwald called such hypothetical machine as perpetual motion machine of second kind. The experimental facts state that it is impossible to build such perpetual motion machine of second kind. Therefore, the impossibility to build such machines was stated as the postulate. This postulate is the postulate of the second law of thermodynamics. There are three formulations of these postulates:

1. postulate of William Thomson: It is impossible such cyclical process the unique result of which is the production of work by cooling of the cold reservoir.
2. postulate of Clausius. The heat can not be transferred by itself from cold body with small temperature to the hot body with high temperature. So, the formulation of conception of second law of thermodynamics of microeconomical systems can be stated as: It is impossible to have such business perpetual motion machine of second kind to produce turnovers by itself without requesting of stocks from dealers, without permissions and licenses of business activity, without paying of all kinds of taxes. Referring to the postulate of William Thomson: It is impossible to have such economical cyclical process, the unique result of which is the production of turnovers by decreasing the economical temperature of cold reservoir till zero. It means that the prices of products from dealers can not be zero. Referring to the postulate of Clausius: The money can not be transferred from small economical temperatures to high economical temperatures. The money always are transmitted from high economical temperatures (market of customers) to small economical temperatures (market of dealers).

7. The conception of Carnot cycle for the microeconomical systems

Regarding the Carnot cycle (K. Stowe, 2009), this is a quasistatical process for which the system can be in the contact with two thermal reservoirs that have the constant temperatures T_1 and T_2. The hot reservoir has temperature T_1 but the cold reservoir has the temperature T_2. ($T_1 > T_2$). The efficiency of the heat engine based on Carnot cycle is calculated as:

$$\eta = \frac{\Delta Q_1 - \Delta Q_2}{\Delta Q_1} = \frac{T_1 - T_2}{T_1} \tag{21}$$

Adjusting the cycle Carnot to the microeconomical system it is explained as follow. The system starts from first position under the influence of the torrents of customers (Figure 10). It receives the heating from customers and the stock is sold. As time is increasing more stocks are sold. The ABC analysis shows that the average price of one product is decreased with the increasing of the time [1], [2]. The isothermal line 1-2 is valid because of the stable torrent of buyers and various rich stock articles and the high economic temperature of the buyers coincides with the economic temperature of this line that is the isothermal line. The economical temperature of isothermal line (1-2) is K_1 and for the line (3-4) is K_2 (Figure 10). The adiabatic segment 2-3 is characterized by the absence of any heat (the adiabatic process is such process that takes place without the receiving or transmitting of any heating (K. Stowe, 2009)). The expensing till the point (3) takes place without the receiving of any heat (process that takes place without any payment). Also this process can be considered as the process of the selling of stocks with discounts and promotions. We know from thermodynamical physics (K. Stowe, 2009) that the adiabatic line crosses through a lot of isothermal line as represented on Figure 10 (dotted isothermal lines). The crossing through several isothermal lines with smaller and more smaller economical temperatures means that the prices can be discounted gradually till some minimal value. The earned money till the moment of time corresponding to the state (2) is equal to the earned money at the state (3) and the quantity of products $\Delta N_{3\text{-}2}=N_3 - N_2$ are sold without the earning of money. It means that some products are sold with discount or promotionally. Referring to the pharmacy the selling of products by the discount is the selling according to the Health fund's policy (the selling by the discount or the discounting till 100% for some products). Referring to the segment (3-4) (Figure 10) this one is characterized by the work done upon the system and is equal to absolute value of the work for the direction (4-3) but with sign minus. The receiving of the stocks from dealers takes place on this segment (3-4) with the amount $\Delta N_{3\text{-}4}=N_3 - N_4$; $(N_3 > N_4)$; The promotional products with discounts or null price also can be received from dealers with the amount $\Delta N_{4\text{-}1}=N_4 - N_1$; $(N_4 > N_1)$.The internal energy of entire system is restored to the initial state in the point (1) when the system returns back into the state (1). The variation of internal energy of entire cycle is zero ($\Delta U=0$).

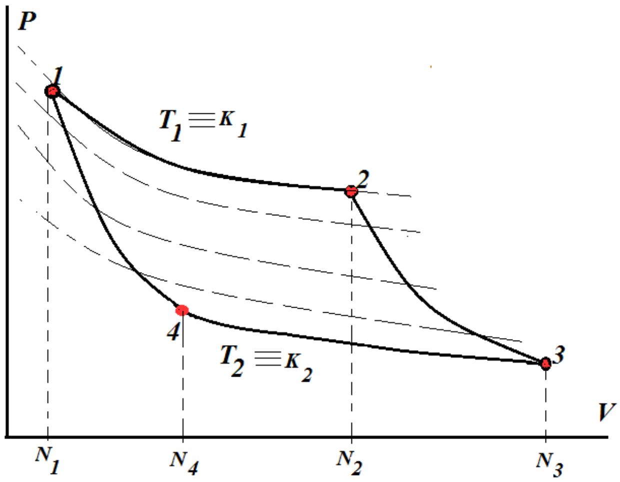

Figure 10. The cycle of Carnot

The stock is restored to the initial state (1). Such a way, the processes 1→2→3, 3→4→1 are repeated cyclically. The heat ΔQ_{12} that is received from the hot reservoir (1→2) means that the customers pay for bought products, but the heat ΔQ_{21} that is transmitted to the cold reservoir (3 → 4) means the payment to the dealers for the request of new stocks. The process of formation of incomes, earning and expenses can be explained by heat engine that is based on the theoretical principle of Carnot cycle. The principle of work of this heat engine is represented on Figure 11, a. The heat engine consists of heat reservoir, cool reservoir and the working substance (the gas).The microeconomic market can be associated to this heat engine and the working substance of this heat engine are the products (the heterogeneous mixture of stocks and the torrent of customers), (Figure 11, b).

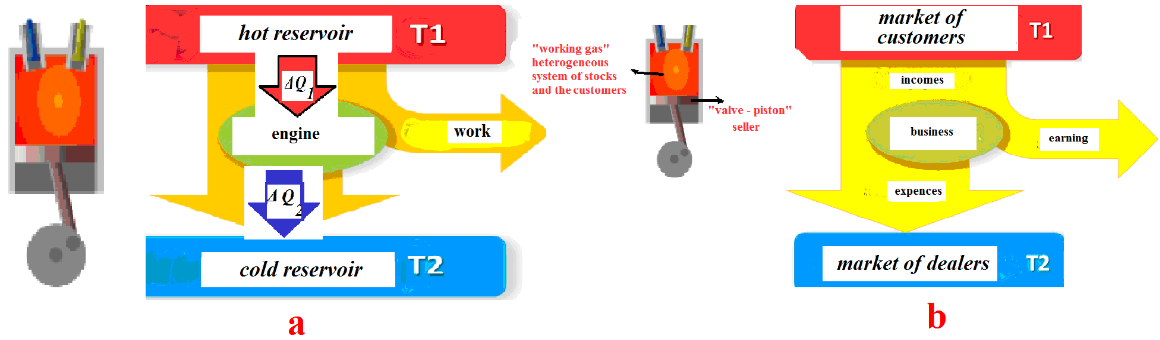

Figure 11, a - The principle of work of heat engine;
b - The scheme of the activity of microeconomic system

The thermal efficiency of this heat engine is the percentage of heat energy that is transformed into work. The thermal efficiency is defined as:

$$\eta = \frac{\Delta W_p}{\Delta Q_1} = \frac{\Delta Q_1 - \Delta Q_2}{\Delta Q_1} = \frac{T_1 - T_2}{T_1} \equiv \frac{K_1 - K_2}{K_1} \tag{22}$$

The value ΔW_p is the earning (profit) by econophysical point of view. This value ΔW_p differs from the work calculated in Equation (18). The work of Equation (18) represents the turnover during a day, but the value ΔW_p represents the profit. The value K_1 is the econophysical temperature of the bought products ("hot reservoir"), but the K_2 is the econophysical temperature of the dealers ("cold reservoir") and this temperature is related to the prices of dealers. For example, if the average price of selling is 15% bigger than of the prices of dealers then the efficiency is calculated as:

$$\eta = \frac{K_1 - K_2}{K_1} = 1 - \frac{K_2}{K_1} = 1 - \frac{K_2}{1.15 \cdot K_2} = 1 - \frac{1}{1.15} = 1 - 0.869 = 0.13 \tag{23}$$

Regarding the rating coefficients of the stock K_A, K_B, K_C, K_X, K_Z as the econophysical temperatures, and the temperatures of stocks from dealers as K_A^d, K_B^d, K_C^d, K_X^d, K_Z^d, and the temperatures of mixture of the stocks as K_{ABCXZ} and for the mixture from the dealers as $K_{ABCXZ}{}^d$, then the efficiency is calculated as:

$$\eta = 1 - \frac{K^d_{ABCXZ}}{K_{ABCXZ}} = 1 - \frac{1}{1.15} = 1 - 0.869 = 0.13 \tag{24}$$

The Equation (24) works better in the case of ideal activity of the market for such situation when the part of turnover is used to recover the expenses and to restore the initial quantities of stock articles. If we regard the full ensemble of the stock articles and the case of efficiency *0.13* and the econophysical temperature of total selling ensemble is K_{ABCXZ} =5.65 then respective value $K_{ABCXZ}{}^d$ for the stocks of dealers is *1.13* times smaller than K_{ABCXZ} and the result is $K_{ABCXZ}{}^d$ =3.67. If K_{ABCXZ} is the turnover of one stock article during a day, then:

$$K_{ABCXZ} = \frac{K^d_{ABCXZ}}{1 - \eta} \tag{25}$$

Considering the amount of articles N_{art} and the interval of time Δt (days), then the turnover T during the interval of time Δt is calculated as:

$$T = \frac{K^d_{ABCXZ}}{1 - \eta} \cdot N_{art} \cdot \Delta t \tag{26}$$

For the case Δt =1 day then $T = \Delta W$ is nothing else but the turnover during a day that is calculated by the Equation (18). In general, the Equation (26) is the turnover during the interval of time Δt and just simply $T = \Delta W_{\Delta t}$. For big stores or supermarkets the demanded articles during a day (Δt =1) is: N_{art} ~ 1000 - 10000**,** and the forecast turnover with the efficiency 0.13 is:

$$\Delta W = T = \frac{5.65}{1 - 0.13} \cdot (1000 \rightarrow 10000\ ) \cong 6400 \rightarrow 66000\ \ n.c.or\ \ \$ \tag{27}$$

For small shops or minimarkets the demanded articles during a day (Δt =1) is: N_{art} ~ 25 -1000, and the forecast turnover with the efficiency 0.13 is:

$$\Delta W = T = \frac{5.65}{1 - 0.13} \cdot (25 \rightarrow 1000\ ) \cong 160 \rightarrow 6400\ n.c.or\ \ \$ \tag{28}$$

8. Conclusions

Econophysics that is a new branch of the study of economy includes not only proper sense of econophysics as usual but also physical economics that explains the economical processes by the application of physical phenomena and has a large priority to choose the adequate physical model for the quantitative description of the economical processes. The ABC analysis allows to use the model of ideal gas of the mixture of gases corresponding to the rating groups of ABC analysis. The formulated conceptions of first and second microeconomical thermodynamical laws for the systems allow to understand better the basic mechanisms of turnovers of the stocks and business activity. The obtained formula of turnover by thermodynamical method is simple and contains only three parameters K, N_{art} and N. The linear dependence of $\Delta W=f(N_{art}\cdot ln(N+1))$ and the calculated value of the slope demonstrates the fairness of this thermodynamical method. The second law of thermodynamics and the cycle of Carnot allows to obtain the quantitative description of the activity of various microeconomical systems by the application of the values of econophysical temperatures of the stocks that serve for the forecasting of the future incomes.

References

Petrov M., Petrova V., (2016), "The study of the principle of Pareto in the pharmaceutical activity" , *VI-th Congress of Pharmacy with International Participation, Sandanski, October 13-16*.

Petrov M., (2017), "Probabilistic and thermodynamical approximation of the model of ideal gas for the microeconomical description of ABC marketing analysis", *III-rd International Conference of Econophysics, Greece, Volos, September, 26.*

Richmond P., Mimkes J., Hutzler S., (2013), Econophysics and Physical Economics, Oxford Scholarship Online.

Sergeev V., (2008), The thermodynamic approach to market translated from the Russian and edited by Dimitry Leites, 56-68.

Цирлин А.М., (2011), Оптимизационная термодинамика экономических систем, Научный мир, ISBN 978-5-91522-276-1, 150-200.

Caplice C., (2006), Supply Chain Fundamentals and Segmentation Analysis, *Logistics Systems*, 1-27.

Geerolf F., (2016), A Theory of Pareto Distributions, UCLA , 1-48.

"Average sales per store of US supermarkets 2012-2016" (2018).https://www.statista.com/statistics/240948/average-sales-per-store-of-us-supermarket.

Taylor K., (2016), "12 fast-food chains taking over America". https://www.businessinsider.com/restaurants-with-the-12-top-unit-sales-2016-8 (August 2, 2016)

Wong K., (2017), "What is the average revenue for a small clothing store?". https://www.quora.com/What-is-the-average-revenue-for-a-small-clothing-store (October 28, 2017)

Wells J., (2017), "A grocery store's average annual turnover cost is $67K, says consultant".https://www.fooddive.com/news/grocery--a-grocery-stores-average-annual-turnover-cost-is-67k-says-consultant/505113 (Sept. 18, 2017)

Hossain S., (2016), "How much revenue does a local Exxon/Shell Gas Station bring per month on average?".https://www.quora.com/How-much-revenue-does-a-local-Exxon-Shell-Gas-Station-bring-per-month-on-average (Jul. 25, 2016)

Rating S., (2007), Study on the petrol station market, 31-35, https://www.bft.de/files/2913/5946/6901/btsmarkt07_en.pdf

Jones M., (2013), "What Does It Take To Start A Hotel?" https://www.forbes.com/sites/quora/2013/02/28/what-does-it-take-to-start-a-hotel (Feb. 28, 2013)

The revenues of exchange currency offices, https://www.pariteni.bg/?tid=40&oid=84351 (Jan. 10, 2013)

Arpa S., (2018), How much does an average movie theater make in a day? https://www.quora.com/How-much-does-an-average-movie-theater-make-in-a-day (Apr. 10, 2018)

Lazzari Z., (2018), The Average Revenue of Small Bookstores, https://yourbusiness.azcentral.com/average-revenue-small-bookstore-28217.html (May 14, 2018)

Stewart H., Hyman J., Buzby C., Frazão E., and Carlson A., (2011), "How Much Do Fruits and Vegetables Cost?", *Economic Research Service*, *Economic Information Bulletin,* 71, 1-37

"Dental examiners procedures manual", www.cdc.gov/nchs/data/nhanes/nhanes_03_04/DentalExaminers-2004.pdf, (2004)

"Medical Laboratories Industry", https://csimarket.com/Industry/industry_Efficiency.php?ind=805

Drancourt M., Michel-Lepage A., Boyer S., Raoult D., (2016), "The Point-of-Care Laboratory in Clinical Microbiology". https://cmr.asm.org/content/29/3/429 (March, 30 2016)

"Households with people who bought cosmetics/perfumes in the U.S. 2018 to 2020", (2018), https://www.statista.com/statistics/231406/people-who-bought-cosmetics-within-the-last-12-months-usa/

Yara G., (2018), The Average Profit Margin of a Hair Salon. https://yourbusiness.azcentral.com/average-profit-margin-hair-salon-26276.html (May 07, 2018)

"Shipment forecast of laptops, desktop PCs and tablets worldwide from 2010 to 2022", (2018), https://www.statista.com/statistics/272595/global-shipments-forecast-for-tablets-laptops-and-desktop-pcs/
"Invest in Bulgaria", http://investbg.government.bg/files/useruploads/files/iba_investment_catalogue.pdf.
"Estate agents sell just one home a week on average as property market struggles", (2011), www.dailymail.co.uk/news/article-2003252/Estate-agents-sell-just-1-home-week-property-market-struggles.html (June, 14, 2011)
"Cars for sale". www.carmax.com/cars
"Number of cars sold worldwide from 1990 to 2018 (in million units)" (2018), https://www.statista.com/statistics/269872/largest-automobile-markets-worldwide-based-on-new-car-registrations/
"How to start a parking lot business", https://howtostartanllc.com/business-ideas/parking-lot.
"Global Consumption Data Base", http://datatopics.worldbank.org/consumption/
Stowe K., (2009), An introduction to thermodynamics and statistical mechanics, Second Edition, Cambridge University Press.