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THE NATURE OF CAPITAL AND THE MONEY-GOODS ECONOMY IN A CONTEMPORARY ENERGETICS APPROACH

The essence of capital and money-goods economy in the modern energetic approach has been considered in the article

Abstract

At the beginning of time, Prime Energy began Her labour creating Universes – matters and spirits and laws of their evolution towards societies of human beings. Therefore all creatures are energetic by nature and must maintain an adequate level of energy's concentration to continue their life in their existing shape. In economic language, economic power is called capital, although academics have not been fully aware of this connection. Much trouble with real economies, and economic theories as well, has its roots in the lack of reconciliation of energy concept with physics and economics. Capital, in its sense of being used to "do something", is analogous to a property in physical science that is labelled as "energy". Energy is often defined as "the capacity to do work". And thermodynamics is the field in which the applications of energy and heat are thoroughly studied. Thermodynamics provides us with a useful analogy for understanding capital. The second law of thermodynamics is a key to understanding the properties of energy and is used as a prime analogy for understanding capital and its theories. This approach to capital and value sheds new light on such economics and accounting topics as human capital, labour cost, the nature of the money unit, interest rates and discount rates. Finally, as the result of this new approach, some new ideas about how to reduce taxes emerge from the inner quality of the money-goods economy. This paper includes an outlook of the main ideas of the money-goods economy as seen from the capital point of view.

1. What is capital? Law of energy conservation

Although the term is widely used in economics and finance and has been researched by recognised economists, their efforts basically failed and in 1975 Ch. Bliss [p. 7] could write: *"(...) When economists reach agreement on the theory of capital they will shortly reach agreement on everything. Happily, for those who enjoy a diversity of views and beliefs, there is very little danger of this outcome. Indeed, there is at present not even agreement as to what the subject is about (...)".*

Let us remind that the term capital has been used as early as in thirteenth century and some simple accounting systems, which enabled the measurement of periodical capital changes, had appeared in this time. In 1921, E. Cannan offered the following explanation of capital:

"(...) It would not have been at all surprising if the adjective capitalis, formed by the Romans from their substantive caput, which is the Latin for our substantive "head", had been applied by them to many different things. We ourselves, using "head" adjectivally or in composition with a hyphen, talk of head-keepers, head-offices, head-quarters and many other "head" things. But, if the dictionaries are to be trusted, Latin writers of the classical period generally confined their use of capitalis to the sense in which we, following them, use the adjective "capital" in applying it to crimes and punishments in the sense of "having to do with life". But they did sometimes use it in what to us, with our belief that the head is the seat of personality, seems the more obvious sense of "most important". (...) Now if we ask ourselves what is the chief sum of money dealt with in any particular business, whether that business is carried on by an individual or by a small number of partners such as we call a firm or by a larger number of partners such as we call a company, the answer is "the sum which is the foundation of the business, the total of money on which the individual, firm or company carries on trade". At first this is, of course, the amount with which the business is started; later, it is that amount plus any additions which may have been made to it, and minus any subtractions which may have been made from it. What additions and subtractions should properly be made is constantly a matter on which opinions differ, and the rules generally accepted differ to some extent between different kinds of business and even within the same kind of business according as it is carried on by an individual or a firm or a company. (...) The kind of pre-eminence which it possesses is the same as that which a sum lent has over the interest upon it and which leads us to call that sum "the principal sum", or, for short, "the principal"(...)."

There is some evidence that authors searched for fundamentals when considering and linking capital, interest and profit. The exchange of present goods for future ones is a source in which interest has its origin. This idea was clearly presented by E. von Bohm-Bawerk [1891] in his book about positive theory of capital. All great economists have linked capital with income, interest and even with category of time as was showed by F. Fetter [1977, 1990] who, among others, analysed how economists have understood the concept of capital.

Our attempt to explain capital relies on referring to practice. No one agrees to waste his capital in business, therefore useful systems of measurement were

established as early as XIII century when economy has began to develop. Therefore to understand capital, it is necessary to go back five centuries back to fifteenth century when L. Pacioli published his famous book[1]. Recall that in the fifteenth century sciences such as economics and physics did not exist. Pacioli described a system of measuring capital, which was indispensable and useful in conducting a business. He did not invent it as a scientist; it arose from practical needs. Capital as an economic energy; is abstract, homogeneous medium embodied in material or non-material assets.

The double-entry accounting system is based on the concept of capital, as energy, which does not arise from nothing. This is the essence of the duality principle. Double entry results from this law of energy behaviour. According to the principle of duality, economic means are accounted twofold; as assets (A) and capital (C). Therefore, in the beginning we have the following equation:

Assets = Capital

This equation forms the basis of contemporary financial accounting and language of business. Concrete, heterogeneous assets are equal in value to the homogenous, abstract capital. Just like the spirit moves the body, the capital embedded in the assets makes them capable of generating future revenues and multiplying the initial capital. An asset is subject to depreciation while capital, on the contrary, is expected to be increased in good rate. What, then is new and creative in this simple and meaningful equation?

The basic equation of accounting differentiates equity capital (E) and debt capital (D), so that the equation is as follows:

$$\mathbf{A = E + D}$$

Following from the above equation, the profit in a given period can result in increases in equity after equivalent exchanges with social, natural, and business environment. This is reflected by the formula:

$$\textbf{Periodic income} = \Delta\mathbf{E} = \Delta\mathbf{A} - \Delta\mathbf{D}$$

However, in order to understand nature of profit, the deeper qualities of energy have to be applied. The Theory of Thermodynamics provides us with the right tools and analogies to explain capital, risk, income and interest.

Equity capital is analogous to economic energy under control of the owner and value must be understood as a concentration of energy in objects. Each object – physical or legal – needs energy for its existence. An object should not waste this energy, otherwise it will "end" its existence. This energy has to be measured in order to check that it is maintained, not wasted and this is the aim of our accounting

[1] Luca Pacioli published his most famous book entitled *Summa de arithmetica, geometria, proportioni et proportionalita* in Venice in 1494.

system that measures capital and its changes. It is principle of conservation energy as its very background. Capital (energy) does not arise from nothing; in context of business unit it is the premise of double accounting and the mode of computing periodic profit. Therefore accounting systems are essential to help investors, managers and entrepreneurs to evaluate the continuation of existence of a business or of an entire economy. Nobody conducts enterprise in order to waste capital.

By analogy, capital may be viewed as "energy" for the world of economics and finance as compared with "energy" as applied to the worlds of chemistry and physics. Continuing with this analogy, value represents a concentration of energy (capital) in objects. Science tells us that inanimate, chemically inert objects at very low temperatures have virtually no energy within them. In contrast, animate creatures and airplanes flying rapidly must have highly localized energy content in order to continue to exist. Such physical energy can be assessed to determine if the organism or the object can go on with processing of energy (that is what life or the operation of machinery consists of). Thus we have found an excellent analogy in science, to explain the capital and value and purpose of accounting systems, which measure capital and its changes.

If capital is being conceived as a sort of energy, then the question on the relation between the theory describing the behaviour of energy in natural science and the theory describing the behaviour of energy in economy science arises. In particular, in what way are the first and the second law of thermodynamics, i.e. the law of energy conservation and the entropy concept, interpreted in the economics thought? P. Mirowski [1989] carried out an outstanding and astute research on the appearance of energetics metaphors and concepts in the economic thought. Although the outcome from Mirowski's analysis discloses, that much on that subject has been said, and scientists, such as: T. Veblen, W. S. Jewons, I. Fisher, W. Pareto, L. Walras and others, have conceived value and utility through the physical understanding of energy and mechanics has been recognised as a benchmark and framework for economic science, the idea of capital still remains tangled, unsolved and not clear. W. S. Jewons [1895, p. 50] explicitly states that the concept of value in our science is exactly the same as energy in mechanics. In 1926 I. Fisher created a table which contained translation of physical categories into their economic analogies [Mirowski, 1989, pp. 224-225]; energy was equivalent for utility. However, the economists haven't clarified and illuminated the subject. Piecing value together with energy, they have not affirmed that capital as economic concept has all features of energy and value should be understood as concentration of energy in an object. Furthermore, the right analogies between the laws ruling over energy in physics and the laws ruling over capital in

economy have not been found. The main aim of this paper is to highlight these relationships.

2. The Second Law of Thermodynamics in Economics Context

In the physical world energy plays a fundamental role in all spontaneous events. Its pedantic definition is "the capacity to do work". A most important facet of energy's behaviour is called "the second law of thermodynamics". This second law is not complex. It is based on our human experience with events in nature.

With gravity, we know that when a rock falls, its spreads out its energy as it falls and hits the ground. With heat, we observe that hot pans always cool when taken off a stove. With chemical substances, we know that a tree, a piece of paper, a wooden structure will burn, and that resulting energy (originally from the sun, captured by growing plants) will rapidly spread out in heat and light. In these disparate occurrences there is a change that is common to all: energy flows in one direction. The second law may be summarised in the following way: Energy, *if it is not restrained,* flows from where it is localised to where it becomes dispersed, and looses its intensity.

In the late 19th century, before much of modern knowledge about physics and chemistry was developed, the word and concept of "entropy" was used in order to explain energy loss. Its original definition involved the amount of heat (into which any kind of energy can be converted) that was dispersed in any reversible process, divided by the temperature at which the process occurred. This understanding is still totally correct in the 21st century. Thermodynamic entropy, we must bear in our minds, strictly applies only to physical and chemical systems in which molecular or electromagnetic activity involves temperature. The association of the term entropy with "disorder" has been tenacious and stultifying. Even brilliant individuals such as Georgescu-Roegen [1971] and Chalidze [2002], misused the term. Certainly, however, that does not mean that ***analogies*** with the second law of thermodynamics are inappropriate in fields outside of chemistry and physics. The qualitative statement of the second law begins with a focus on the behaviour of energy – the energy does not tend to stay localised.

F. L Lambert (1999, 2002) explains that physicists deal with closed systems but biologists and economists deal with events on the earth, an open system in which enormous amounts of energy flow from the sun to the earth and where small quantities (compared to the total of sun energy, but large over the whole earth) are converted to substances in plants. Plant substances therefore constitute localised/concentrated energy units. When consumed by other organisms, their integral localized energy is slowly released for the energetic needs of the organism. All such organisms are subject to the limitations described by the second law of thermodynamics – that unless hindered, the localised energy will be completely spread out throughout the

environment. That is, death occurs as a normal result of the second law when protective barriers in the organism's biochemistry no longer are functional [see: www.shakespeare2ndlaw.com].

Therefore, the second law describes optimal processes for life. If energy can be accumulated/stored and hindered from spreading out, we can choose to disperse it for our own preferred physical and mental use. However, if the protective "hindrances" provided by innumerable feedback systems in our bodies fail to maintain our storage of energy for such use, the second law predicts that our energy must be dispersed and we would die. But all human activity, including that, which is the subject of economic study, can be considered to be an energy localizing process. Physics and chemistry provide a useful analogy for obtaining new insights into the unavoidable limits of this activity.

Another facet of the second law of thermodynamics is its basis of our psychological sense of time. We know what the passage of time should look like because of the energetic implications of the second law. The second law is also the arrow of time because it points the direction in which energy flows spontaneously – if it is not hindered. S. Hawking [1990] proved the consistency between cosmological, psychological and thermodynamic arrows of time so that the thermodynamic one is responsible for our sense of time.

A viable analogy from the Second Law of Thermodynamics for Economics: Energy spontaneously disperses, if it is not hindered from doing so. Right management is for instance the tool of slowing down the natural capital disperses. In the light of the above, one arrives at the conclusions summarised in Table 1.

Table 1. *Analogies in Science to Value and Its Conservation in Economics*

State/actions	*Physics/ Chemistry*	*Economics*
1	*2*	*3*
Unstable state (Metastable state, one that can change to be unstable)	**Localised or concentrated Energy** (Much energy in small volume)	**Capital is economic energy**. Value is energy concentrated in resources, and goods. Labour is transformation of human capital to products (production functions).
Fundamental generality about source of instability	**The Second Law of Thermodynamics**	**Law of Capital Dispersion** Human factors favour the dispersal of concentrated value. Physical and market factors can alter resources, value of goods.
Description of source of instability	**Energy spontaneously flows from being localised to becoming dispersed and spread out**, *if it is not hindered from doing so.*	**Capital spontaneously disperses** Human nature: disloyalty, dishonesty, greed, corruption, error. Organisation nature: complexity, lack of internal and external controls. Society nature: lack of integrity, nepotism, and unfairness.

1	*2*	*3*
Measure of spontaneous change	**Entropy** Amount of energy dispersed (reversibly) ÷ temperature	**Proportional value decrease** (risk, costs of risk) Value decrease ÷ total of original value
Prevention of change	**Activation energy** Externally designed (human artifice) barriers to change.	**Risk premium given by efficient market** Checks and balances. Honesty, loyalty to integrity of controlling organisation, adherence to strict accounting practices
Additional actions to prevent undesirable change	**Coupling of systems**, as in biochemistry: a spontaneous change in a system supplies new energy to restore the system from which energy is dispersing.	**Management control systems** acts as tools to modulate risks and generate periodic income to restore capital concentration. Interacting systems with the unit from which capital is dispersing can act to restore capital

Authors: M. Dobija, F. L. Lambert. First published in Dobija, M. [2004b].

The phenomenon of capital dispersion is therefore the background of risk, interest, and profits. To earn profits means to protect part of risk premium – given by market – against spontaneous dispersion of capital. We arrive at basic categories as follows:

- Capital is the economic energy this means an ability to do work.
- Value is concentration of capital in products and objects.
- Labour is a transformation of human capital into products.
- Cost of labour is an economic measure of labour.
- Process of composition of costs of labour with assets in production process can be described by production function.

3. Model of capital in dynamic equilibrium

The first law of thermodynamics explains that energy does not arise from anything. The Sun and human labour are the sources of capital when omitting nuclear energy. When we consider a human being as concentration of energy, we can conceive of labour as a process of turning human capital into products. The Sun is the very source of all living beings. But even the Sun is not everlasting because of the process of converting of its mass into radiation ($\mathbf{E=mc^2}$). The second law of thermodynamics explains that energy spontaneously tends to flow only from being concentrated in one place to becoming diffused or dispersed and spread out. Entrepreneurs, managers and employees act to counter this dispersion of energy but free markets helps them offering risk premium to set out natural dispersion of capital.

L. Boltzmann[2] and others have proved [Prigogine, Stengers, 1990], [Pais, 2001], that entropy behaves statistically. Entropy grows constantly or almost constantly. Entropy (the measure of spontaneous dispersion of capital) is the very source of risk. Therefore the cost of risk is random. Although risk is unavoidable, good management can limit risk. Entropy implies the existence of costs of risk as was explained by D. Dobija [2001]. The cost of risk appears to be crucial in explaining the nature of fair income and fair prices. Taking into account the cost of risk and entropy, we can synthesise a model of capital.

Dispersion of capital in the context of economic activities produces risk that manifests itself in reality as the cost of risk. To describe an impact of entropy on capital growth a natural formula for disappearing potential can be used: $\mathbf{V_t = V_0 e^{-st}}$, where V_t – concentration of energy (capital) at time t, V_0 – beginning value, s – rate of disappearing according to arrow of time. In economics this is formula with negative interest with rate s applied in continuous mode.

Assuming a dynamic equilibrium market, successful entrepreneurs and investors may receive a premium for risk. Otherwise, who would want to be the entrepreneur or an investor? To produce an incentive, the size of the risk premium must be adequate to cover costs of risk. Therefore we may introduce a model of capital as follows:

$$\mathbf{C_t = C_0 e^{-st} \cdot e^{E(s)t} = C_0 e^{[E(s) - s]t}, \quad E(s) = p, \quad s = K_r/C_0}$$

where: s – costs of risk ratio, E(s) – risk premium i.e. mean of the costs of risk ratio, t – arrow of time, K_r – costs of risk, C_0 – initial capital.

This model reflects the principle of market equilibrium. The principle of market equilibrium states that free market matches each investing and producing activity with prize called risk premium, which allows the economy to overcome destructive natural forces. Good management can change this dynamic equilibrium into a profit creating system. This formula shows that the risk premium is a mean of ratio (s). The market awards a premium p = E(s) to the entrepreneur who copes with economic risk. Therefore the risk premium (p) is a source of periodic profit provided the management system works well. Mean E(s), a deterministic parameter, expresses the very nature of economic reality. Our research leads to conclusion that risk premium is equal to 8% of initial capital in case of average risk condition. This strong facet of the presented model allows for wide practical applications.

[2] Ludwig Boltzmann worked on statistical mechanics using probability to describe how the properties of atoms determine the properties of matter. In particular his work relates to the Second Law of Thermodynamics, which he derived from the principles of mechanics in the 1890s. Boltzmann asserted that entropy increases almost always, rather than always.

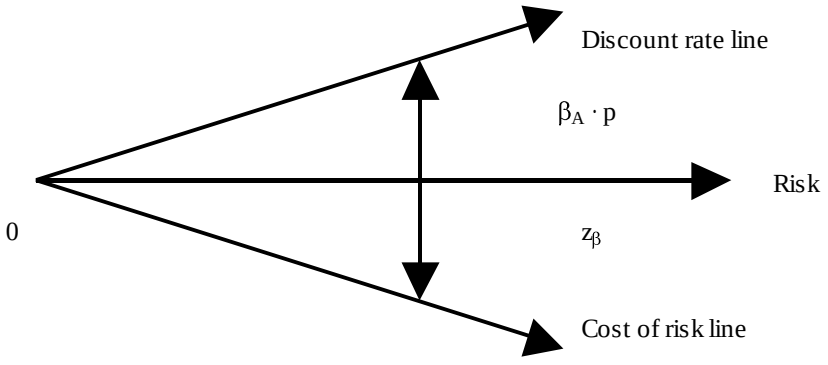
4. Model of discount rate and risk premium size

A category of risk premium is identified in CAPM theory but not measured and therefore there are some doubts and disputes pertaining to this theory and the nature of the discount rate.[3] According to CAPM, risk premium exists as a constant value without any variance. In a particular case of higher or lower than average risk it is modified by coefficient beta determining the risk level. This linear model expresses a general law of nature, according to which an efficient market grants investors on capital market premium $\boldsymbol{\beta_A \cdot r_p}$ for the risk they undertake. It is only natural: the higher the risks - the higher the costs of this risk to the investor.

The general idea of interest rate is resemble to CAPM model. An investment project that belongs to risk class β is exposed for adequate costs of risk ($K_{r\beta}$), and is measured by the ratio $z_\beta = K_{r\beta}/C_0$ where C_0 denotes initial capital. Therefore the discount rate should equalize the negative impact of costs of risk so that the proper size of the risk premium is $\beta_A \cdot p = E(z_\beta)$.

An interest rate model may then be derived from the above. The basic interest rate is equal to risk premium so **i = p.** In case of higher risk of investing in some assets (A), $\mathbf{i = \beta_A \cdot p}$. Including random factor we get $\mathbf{i = \beta_A \cdot p + r_f}$**, and** $\mathbf{E(r_f) = 0}$**.** We come to model generalised to all investment activities. If there is no risk, there is no return, therefore mean value of r_f should be equal to zero. An efficient market assumption is required for this formula to hold. It is illustrated in Figure 1.

Figure 1. *Discount rate line as risk premium line equalising costs of risk*



There is a great difference between the theoretical (ex ante) discount rate r_T and the actual return on investment (ROI). ROI is an *ex post* random value with big variance, but r_T is *ex ante* deterministic value. The formal relation is as follows:

$$\mathbf{ROI = r_T - K_{r\beta}/C_0 + M,}$$

[3] Neither expected nor planned is an adequate name. If a discount rate is established at 15% should we expect 15% actual rate of return in the light of existing costs of risk?

where M denotes variable of management. Since costs of risk are random values, ROI is a random variable too.

5. Empirical evidence of risk premium size

How do models of capital and interest rate apply to the economic reality, and what is the size of the risk premium? Risk premium may justly be perceived as a physical variable. If an investor builds a mine, accidents and other unexpected events may occur. If he invests in sea liners, other types of risk may be imagined and so forth.

This constant is – so far – the only economic constant which can be compared to the many constants in physical theories, such as the Earth gravity acceleration constant. S. Hawking [p. 120] argues that the laws of science, which we are aware of today, include many basic physical constants, such as the electric charge of an electron or the relation between mass of proton and mass of electron. Today we still are not able to compute these constants on the basis of some kind of theory – we only can measure them by the means of experiments. It is possible that one day we will discover one, homogeneous, complete theory, which will be able to anticipate the values of these numbers. However, it is also possible that these numbers differ depending on the part of the Universe. It is also worth to take into consideration that these values might be gathered very precisely in order to enable the development of life. The size of risk premium denotes the economic conditions on the planet Earth. Taking into regard that constant and at the same time not manipulating the economic conditions, a state of efficient market can be obtained.

The list of empirical evidences involves as far:

- Ibbotson and Sinqufield estimation of risk premium.
- Human capital.
- Minimum wages computations.
- Basle Committee on Banking Supervision Regulations.
- Interest rates practices.
- Pricing decisions.

Let as examine each of the above position. Risk premium is after all met in capital markets. I t appears as a part of CAPM theory and as an issue of empirical research accomplished by Ibbotson and Sinquifield. Part of these issues is in the body of table 2.

Table 2. *Average rates of return on Treasury bills, government bonds, corporate bonds, and common stocks, 1926-1994 (figures in percent per year)*

Portfolio	*Nominal Rate of Return*	*Real Rate of Return*	*Average Risk Premium (Extra Return versus Treasury Bills)*
1	*2*	*3*	*4*
Treasury bills	3.7	0.6	0
Governments bonds	5.2	2.1	1.4

1	*2*	*3*	*4*
Corporate bonds	5.7	2.7	2.0
Common stocks	12.2	8.9	8.4
Small firm common stocks	17.4	13.9	13.7

Source: Brealey R. A., Myers S. C.,[1996], Principles of Corporate Finance, p.146.

Risk premium calculated as 8.9 – 0.6 or 8.4 – 0.0 gives estimation at 8.3 or 8.4. Risk premium expresses efficient market return in respect to systematic risk, which is the closest concept to risk arising as energy dispersion flows being the very nature of economic activities. Both are unavoidable. According to the estimates by Ibbotson and Sinquifield, real risk–free rate does not exceed 0.5%. When inflation is close to zero, the rate without risk is close to zero. No risk – no profit. Let us note that in Ibbotson and Sinquifield approach, risk premium is measured using ex post data. We know however, that $e^{0.08} = 1.083$, which means that after one year interest rate of $p = 0.08$ can yield increase of initial capital to 1.083. Economy works as continuous process, thus we apply formula $C_t = C_0 \cdot e^{r \cdot t}$ in examining processes of growth. Because $e^p = \sqrt[6]{\Phi}$, where Φ is the golden section ratio connected to Fibonacci series, thus $p = {}^1/_6 \ln \Phi$. Relation between risk premium and Φ show that $p = 0.08$ belongs to set of essential constants that shape Earth conditions.

Human capital

The above 8% rule manifests itself clearly in the analysis of human capital, which can be assigned to a person (an employee). All outlays of costs (N) necessary for the generation of human capital H must be calculated as future value. Therefore we need the capitalisation rate r. Hence:

$$H = N \frac{(1+r)^n - 1}{r}.$$

Labour, measured by labour cots W, is the return determined by rate u on human capital of an employee, therefore:

$$W = u \cdot H = u \cdot N[(1+r)^n - 1] / r .$$

We may prove that the present value of the stream of wages (W) is equal to the capital (H) assigned to a particular employee if and only if discount rate w is equal to r and u:

$$PV = \frac{W}{w} = u \cdot \frac{N[(1+r)^n - 1]}{r \cdot w} = H .$$

The value of capital is maintained when these three rates equal to discount rate. There is an abundance of empirical evidence that suggests that when the r rate of return is determined by the risk premium of 8%, theory and practice remain in accord.

A calculation of minimum wages, as in the body of table 3, for particular groups supports the risk premium calculation of 8%.

Table 3. *Minimum wage in Poland and in the USA*

	USA	*Poland*
Costs of living per person per month[4]	$325	375 zł
Number of years since work started	17.5	17.5
Future value coefficient with the rate of 8%	35.5646	35.5646
Value of employee's capital H	$138,702	160,041 zł
Annual wages 0.08H	$11,096	12,803 zł
Cost of labour per hour (176h)	**$5.25**	**6.06 zł**

Minimum wage at the calculated level is obligatory in the USA. In Poland, social insurance paid by the employer should be taken into account, therefore the minimum wages should be 6.06/1.2041[5] = 5.03 zł per hour. Then 5.03 times 176 h = 885.77 zł. Then, minimum wage fixed for the year 2004 at the amount of 824 zł per month is by 62 zł too low. From table 4, we can see that only the rate close to 8% gives the right result in human capital computations of minimum wages in the USA.

Table 4. *Hourly wages in the USA computed at different conditions*

Rate / Monthly income	*$ 300*	*$ 325*	*$ 350*	*$ 375*
p = 7.5%	$ 4.12	$ 4.46	$ 4.81	$ 5.15
p = 8.0%	$ 4.60	**$ 4.99**	**$ 5.36**	$ 5.75
p = 8.5%	$ 5.12	$ 5.54	$ 5.97	$ 6.39

In the above computations, marginal columns (monthly income $ 300 and $ 375) are disregarded because the cost of living is outside the actual range. Also the first and third row (p=7.5% and p=8.5%) yield out-of-range results. The appropriate values are $ 4.99 and $ 5.36 (highlighted in bold) or $ 5.18 on average.

Interest rates practices and Basle standards

The real sizes of interest rate also indicate on the existence of defined, specific for our reality economic interest rate. One can agree that the interest rate at the level of 2% is very low and may appear only when risk is very small. On the other hand one can agree that the interest rate at the level of 20% is high and might appear when risk is very high. Therefore when a risk is at medium level, a rate can be roughly estimated to (20 – 2) : 2 = 9%. This reasoning realises that interest rates have their ranges and concentrate around some central value.

As commonly known the Basle Committee on Banking Supervision[6] established an adequate size of equity capital as 8% of assets subject to risk. As commonly known

[4] An individual in five-person family.
[5] 20.41 = 9.76+6.50+1.62+0.08+2.45 (sum of different insurance components)
[6] Basle Committee on Banking Supervision, *The New Basle Capital Accord*, January, Bis, Basle, January 2001.

equity capital in a bank serves a role of insurance against risk of negative period profit and loss account. Accordingly, this practice confirms the existence of defined, specific size of risk premium, determined by 8% of initial capital. It is needless to say that banking, as industry, belongs to average class of risk.

Pricing decisions

The risk premium manifests itself in prices of products shaping the labour costs and profits on products. Research which has been conducted by a number of authors, such as J. Kuchmacz [2004], D. Dobija [2000] show the empirical evidence that a risk premium exists in prices of products exchanged on effective markets. These researches indicate the risk premium size as equal to eight percent of invested capital, provided the market is functioning in a good manner. Lack of market efficiency can be identified with the risk premium essentially different form eight percent. This opinion concerns the activities with average risk level. The estimation of the risk premium in prices requires identification of market efficiency and the level of risk.

6. Human capital model and basic pay theory

Personal Human Capital Model

The general model of capital allows us to introduce a specific model of personal human capital, as has been done in earlier paper [Dobija, 1998]. The basic model derived from nature of capital describes a set of variables, which are adequate in measuring human capital value H(T).

$$H(T) = (K + E)\ (1 + Q(T))$$

$$Q(T) = 1 - T^{\frac{\ln(1-w)}{\ln 2}}$$

where: K – capitalized cost of living; E – capitalized cost of professional education; T – years of professional experience; w - learning parameter as assigned to an individual.

From the above models stem formulas of measuring an intellectual capital and an experience capital as discussed in the former papers [Dobija, 2000, 2003].

INTELLECTUAL CAPITAL I(T)

$$I(T) =_{df} H(T) - K = E + H \cdot Q(T), \qquad \text{where } H = K + E = H(0)$$

EXPERIENCE CAPITAL D(T)

$$D(T) =_{df} H(T) - H = H \cdot Q(T)$$

TOTAL HUMAN CAPITAL VALUE

$$H(T) = K + E + D(T)$$

The above additive form of human capital model is useful for modelling of compensations consistent with value of employee's capital.

Pay models stemming from IRR concept

The concept of IRR expresses an essential aspect of capital: its necessary need to grow. Assuming that capital assigned to an individual with T years of professional experience is denoted as H(T) thus IRR concept in respect to human capital can be written as follows:

$$\mathbf{H(T)(1 + r) = W + H(T + 1)}$$

where: r – expected rate of return, W – cash flows received by the individual during the one year period in the form of wages and fringe benefits. Finding variable W one can derive an adequate earning model:

$$W = H(T)\, r - H\,[Q(T + 1) - Q(T)] = H(T) \cdot r - \Delta D(T)$$

The above model confirms Sunder's [1997, p. 36] opinion that experience is a "by-product of doing a job" and thus can modify earnings in the short run. The model reflects an interesting phenomenon. Earnings can be lower in some cases because of the non-monetary benefits in terms of experience the employee gains during the course of a year. An employer may be aware of the resources, opportunities and benefits enjoyed by an employee as well as on the-job-training opportunities. Barron, Berger and Black, [1998] examined the relationship between on-the-job-training and starting wages. The study found that starting wages can be somewhat lower if the job involves training. According to the above model, the gained experience is capitalized, increasing earnings potential in following periods. However, it has to be mentioned in here that factor $\Delta D(T)$ is quickly decreasing.

The last factor diminishes quickly in time so the general wage model can be limited to formula:

$$W = r \cdot H(T)$$

The above model is a source of different models of remuneration [Dobija, 2000]. These models are a convenient tool for investigating the rate of return on personal intellectual capital I(T) and it takes a different approach to the one proposed by G. Becker and his followers.

S. Sunder [1997, p. 35] wrote that human capital is inalienable. It is true that it is physically impossible to detach the stock of human capital from its holder as well as its intellectual capital. And there can be no market for such a resource in its capitalized form. Nevertheless, we can measure it because human capital and its parts are measurable categories. In the body of the table 5 there is data from application of presented model to young polish and American academic professor. Monthly costs of living are assumed on higher level than average.

Table 5. *Assessed basic salaries of professors at the age around 40 in the USA and Poland*

Variables	*Poland*	*USA*
Years of living costs' accreting	25 years	28 years
Monthly cost of living	420 zł	$400
Years of professional education costs' accreting Poland (mgr 5 yrs + dr 5 yrs + dr hab. 5 yrs = 15 yrs) USA (bachelor 4 yrs+ master 2 yrs + dr 4 yrs = 10 yrs)	15 years	10 years
Monthly cost of education	350 zł	$ 850
Years of work T	15 years	16 years
Coefficient of learning	10%	10%
Percentage of insurance from a university	20%	15%
K	368,454 zł	$ 457,626
E	114,039 zł	$ 147,763
Percent from experience Q(T)	35 %	35 %
H = K + E	482,493 zł	$ 605,389
D(T) = H · Q(T)	168,873 zł	$ 211,886
I(T) = E + D(T)	282,912 zł	$ 359,649
H(T) = K + E + D(T)	651,366 zł	$ 817,275
Annual cost of labour W = 0,08 · H(T)	52,109 zł	$ 65,382
Monthly cost of labour (:12)	4,342 zł	$ 5,448
Salary without insurance	3,619 zł	$ 4,738
Annual basic salary without insurance	43,428 zł	$ 56,856

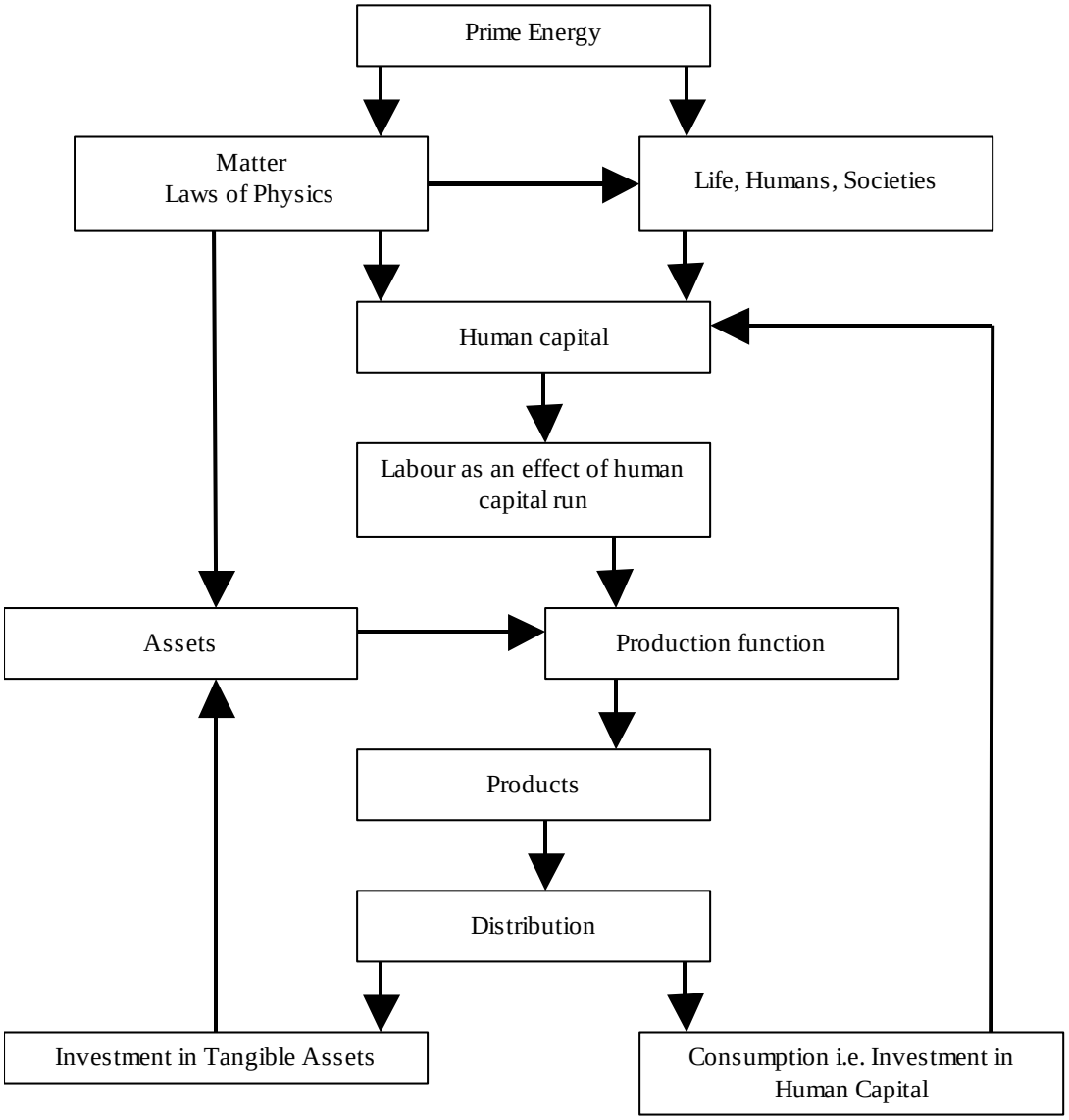
The real salaries at that professional group in the USA are generally included in the range between $55,000 and $80,000. The lower level of the salary is usually achieved by the academics who possess doctorate in that science field which is characterised by relatively high level of supply, e.g. English language. The higher level of the salary is created by market forces and by fame and standard of a university. However the computed level of salaries is dominant.

The assessed amounts of costs of living and professional education need to be further explained. These sums should reflect value, i.e. spending essential to succeed in obtaining intended effect – healthy, educated individual. Such amounts change depending on the socio-economic development. The change in the family model, from 2+3 through 2+2 to 2+1, results in the gradual rise of cost of living. The technical development in households and slow increase in the standard of living act similarly. There appear also some changes in professional education. Studies in private universities and MBA studies are inseparably connected to the greater costs of professional education than traditional studies in state-owned universities. The costs of living and professional education need to be constantly empirically assessed in order to assure reliable outcome of the fair salaries' calculations. In the above numerical example, data on the cost of living are included somewhere between the existence minimum and social minimum. Additionally, costs of professional education are included somewhere between costs of such education in state-owned and private universities.

The human capital perspective on the issues of capital and labour relations differs from the perspective offered by the economic theories. The capital seeks adequate rate of return no matter whether it is located in humans or in business assets. However, in case of human capital, the acceptable level of rate of return seems to be around 8%. Research evidence in Poland [Dobija, 1999, 2000] shows, that compensations with the rate lower than 8% may cause strike actions. The 8% rate of return represents payback period of H/0.08H = 12.5 years. It is the empirical resistance level that should be considered in determining the minimum wages. Then, principle of energy conservation in socio-economic processes is hold. This 8% principle of basic pay is either a premise of market efficiency.

Finally, we present scheme of value and capital flows in figure 2. Energy constantly flows and value localizes in natural, human and physical resources.

Figure 2. *The law of energy conservation in economics context*



In the properly dealt and managed social and economic processes, value (concentration of energy) should increase in a normal course of events. Consumption either must be seen as kind of investment. There is not any destruction of capital and value in normal course of events, besides random dispersion. Armament races, wars and natural disasters are real sources of capital destruction, caused by humans and nature.

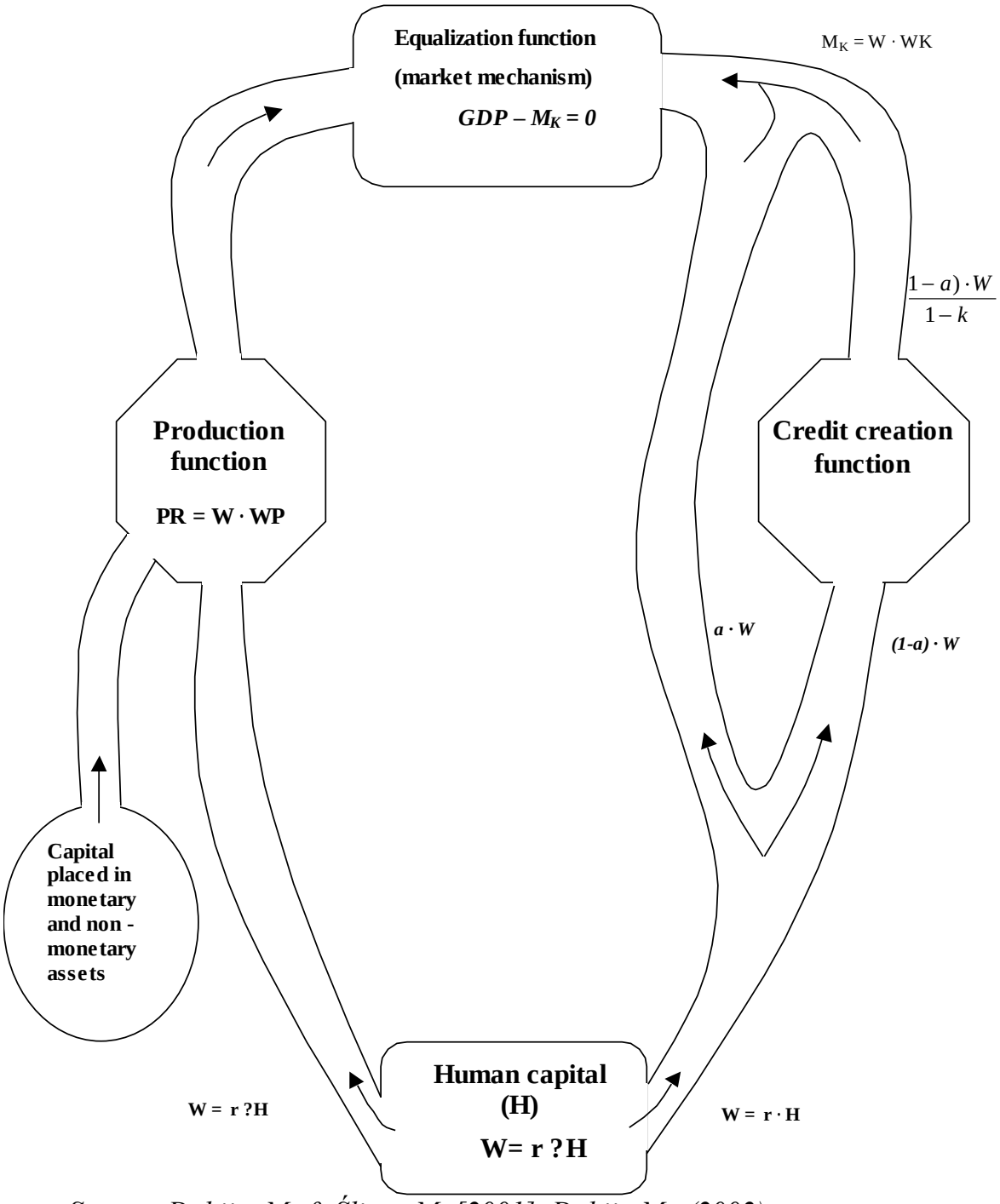
7. Flow Model of Money-Goods Economy and the Equations of Exchange

Having understood economy as a constant flow of energy we attain to the most essential scheme describing dual nature of the money-goods economy. The essence of money-goods economy is the existence of two streams: the stream of products and the stream of money. The source of those two streams is labour of human capital, but the stream of products arises as a result of a composition of labour costs and assets of various kinds, while the source of the other stream is in receivables for work. The second stream is a virtual one. It is created by a sequence of accounting entries recorded and transferred into various banking systems. A constant confrontation takes place in the market, between the products composed of layouts calculated in cost statement, and the stream of money; and as a consequence of this confrontation, the value of exchange is determined. This exchange leads to the equation of exchange of money for goods and vice versa.

In the process of exchanging goods and money, basic economic values are shaped that characterise the economy of a given state unit (a periodical performance) and the economy in general; in particular: the Gross Domestic Product, labour productivity, and inflation index. Measurement of these values is based on the performance principle; therefore, it is done in market value. When we look at it from the point of view of accounting, we can talk about the dynamic balance of the goods and money economy, in which the above variables are revealed as a result of a given market configuration and the goods-money exchange. The exchange process is illustrated by figure 3, which in turn enables the formulation of an exchange equation.

The bottom of the figure 3 shows that it is human being who set into motion labour process. This individual includes some amount of capital denotes by letter H which can be precisely measured in economic terms and the above discussed adequate rate determines right pay (W).

Figure 3. *Market mechanism equalises the stream of products and the stream of money*



Source: Dobija, M. & Śliwa, M. [2001], Dobija M., (2002)

The left side of the scheme shows process of producing goods and services. Labour costs (W) composed with various sorts of assets makes final products (PR) measured in historical costs before confronting with money claims of payable holders.

Relevance of the amount of labour used in particular instance to the market accepted one is tested in the marketplace. According to realization principle: sales of unit valued in market prices is arrived at the moment and part of GDP as well. Process of production is modelled by production function, which can also serves as a determinant of wage productivity (WP).

The right side of the scheme shows not material streams but stream of records arising as a results of pay receivables if considered from employees point of view or pay liabilities when considered from state point of view. This is the responsibility of state, not of banking system that exchange of money for products is running smoothly according to expectation of money holders. Banking system role is creation of credit money (WK) in a way adequate to economy requirements. We shall see later that that process should depend exclusively from real wage productivity. It depends to some extent from parameter (a) which express society attitudes and degree of poverty.

The upper box shows the constantly accomplished exchanges: money for products and vice versa. This is an essence of monetary economy that the records of wage receivables are exchanged for goods. Despite of fact that these receivables change the owner and play a role of the most required assets for them, they remain still as liabilities of the state system. This process can be roughly described by the equation of exchange. Obviously, the more money in respect to bulk of goods the higher prices, and higher inflation rate. However, **pay should be in accord with value of labour** is the only correct conclusion stemming from the above considerations. Money arises as wage receivables no matter how Central Banks disturb this process.

The wage equation of exchange

Assuming that a market mechanism does equalise value of streams of money and products, the following equation can be written and called ‘the wage equation’:

$$\mathbf{GDP = GDPR \cdot (1 + i) = W \cdot WP = M_K = W \cdot WK,}$$

where GDPR – denotes real GDP, and i – denotes inflation.

Directly from our equation of exchange stems the following condition:

$$\mathbf{GDP/GDPR = 1 + i = WP/RWP, \qquad RWP = WP/(1 + i),}$$

where RWP denotes real wage productivity.

According to the above formula, in the situation of zero inflation, the nominal labour productivity equals the real productivity. In other words, all processes are managed in such a way that an increase in wages always stems from the growth of labour productivity. In addition, the creation of credit money is limited by the real productivity of labour. The concept of inflation understood as a relationship between the nominal and the real labour productivity describes the degree of chaos in a given economy, and this chaos will not be remedied by a monetary policy. Appropriate

management systems assuring consistency of value of labour with compensation are necessary in all organisational units of the private and the public sector.

The monetarist equation of exchange

The well-known monetarist equation of exchange is as follows:

$$\mathbf{GDP = GDPR \cdot (1 + i) = M \cdot V.}$$

Thus M is money amount and V is circulation of money velocity. Letter (i) denotes rate of inflation; GDP and GDPR denote nominal and real general domestic product. The commonly known variable M is the principal amount of money [Duwendag et al., 1993], [Galbraith, 1982] circulating with velocity V. It is in our opinion a main disturbance in disclosing the true nature of money and money – goods economy. Money does not circulate nor exist principal amount of money as an essential creative idea. Money arises as accounting entry as we proof later. Coins and coined money are the very source of such inadequate concepts. It leads to confusion because money is immaterial. Using the above equation as the tool of monetary policy of decreasing inflation is the main cause of disturbing economy. Relation $1 + i = M \cdot V/GDPR$ is misleading as the concept of basic amount of money produced by coined minds.

Stream of products. Production function

Managers strive for the best combination and orchestration of the production factors. Economists describe this task with the production function, an abstract way of discussing how a given company or economy gets output from its inputs. The production function relates the output of an enterprise to the amount of inputs, typically capital and labour. It describes, in mathematical terms, the technology available to the enterprise. It is important to keep in mind that the production function describes technology, and not economic behaviour. A firm may maximise its profits given its production function, but generally it takes the production function as a given element of that problem.

Philip Wicksteed [1894] first proposed the *production function* for an item (y) in the general form: $y = F(x_1, x_2, ..., x_m)$, which relates a single output y to a series of factors of production $x_1, x_2, ..., x_m$. We shall follow this idea of production function, not any econometric model. We concentrate on a new approach to production function, which involves variables measurable in accounting systems. From accounting point of view product (PR), either less or more intellectual in character, produced by the company, is a composition of labour costs (W), and assets (A) used as materials or partly used machines and appliances. KM and KR denote costs of used assets and random loss of assets, respectively.

$$PR = (W + KM – KR) \cdot (1+r) \cdot (1+I)$$

$$\text{and } PR = (W + z \cdot A – s \cdot A)(1 + r)(1 + I).$$

In the production process, assets calculated in historical costs are used and depreciated in value $KM = z \cdot A$, and unfortunately, are also partly wasted (s), which is manifestation of capital erosion (entropy). Factor 1 + r increases production to average market prices. In some enterprises some undisclosed capital exists and can be called "intellectual capital" (I). The labour costs $L = u \cdot H$ equal the usage of the human capital (H), therefore the production function is as follows (u- payment ratio):

$$PR = W(1 + r)(1 + I)\left(1 + \frac{A}{H}\right) \cdot \frac{z - s}{u}.$$

Those six variables depict the process of the composition of human labour and assets leading to the generation of a product. This function teaches us that it's good if A/H increases, however, this is provided that rotation (z) increases and degree of losses (s) decreases. There are no simple solutions, but there are various systems, such as for example just-in-time delivery. All progressive production systems are oriented on maximisation of the above production function. The above equation also tells us that we should create value (r and I), and attract customers in an efficient way while offering them quality and reliability of our products. A critical issue facing all businesses is how to deliver superior value to their customers at the appropriate cost. The customer-oriented approach to business planning and management provides a logical process that systematically maximises value for both customers and shareholders.

The production function equation says one more thing - that human capital should not be wasted, and adequately qualified employees should be employed at a given post, and paid according to an equitable rate of return (u) of his/her human capital H (T). Level of wages affects created value in two opposite ways. If too high, they decrease productivity by increasing variable (u). If too low, they decrease value of production by decreasing (W). Therefore wages and salaries should be consistent with the value of work and have optimal ratio u.

Production function presented in the analytical approach is based upon six variables, which in turn provide grounds for a number of interpretations and optimisation research. Using the relationship $1 + x \cong e^x$, the complete formula for production function can be presented as follows:

$$PR = W \cdot e^r \cdot e^I \cdot [1 + A/H \cdot [(z – s)/u]] = W \cdot e^{r + I + (A/H) + [(z – s)/u]} = W \cdot WP$$

Product arises from labour leveraged by factor of wage productivity. The variable of compensation may increase or decrease production value at market price. It

is then possible to optimise it. We must note, however, that the level of assets' loss is also a function of many factors, and not just a simple variable. The market shall not cover excessive use of materials but only the use according to norm; neither shall it cover excessively expensive real assets if they weren't essential; or remuneration, exceeding the actual value of labour. The loss must therefore be seen at least as the following:

$$\mathbf{s = a + b(u - 0.08),}$$

where: (**a)** is loss on assets (both real and intangible) while the other factor (**b)** describes loss on human labour. Reasons for losses vary; yet generally speaking they are departures from the rule of equivalence between pay (remuneration) and the value of work. Rate 0.08 presents the minimum degree of remuneration for work done.

Hence the following function:

$$PR = u \cdot H \cdot \exp\left(r + I + \frac{A}{H} \cdot \frac{z - a - b(u - 0.08)}{u} \right)$$

We can therefore seek the maximum production for the given level of pay u, provided a and b parameters have been estimated. Product can be seen as product of cost of labour and increasing factor called wage productivity WP: **PR = W · WP**.

Credit Money Creation Function

On the right side of the scheme there is a stream of money that inflows to the market. Both streams (products and money) confront each other on the market (exchange of money for products). During the confrontation the size of an inflation or deflation variable is disclosed. The money stream can also be quantified as the function of wages (W). Wages paid to employees split into two lesser streams. The first stream has measure a·W, (0 < a < 1), and tends directly on the market without banking system. This means that the exchanges are done immediately. Parameter (a) arrives at this part of wages that are exchanged for products directly, without entering the banking system. The parameter can be interpreted as welfare or poverty level and saving propensity. The second part of the original stream of wages (1 – a)·W feeds firstly the banking system. Then amplified in banking system (credit money creation) flies into market linking earlier with the first sub-stream. Some part of this stream (which is not disclosed on the scheme) is not used by the banking system as a basis for credit creation because of mandatory reserves system and requirements of current accounts conditions. Therefore only a part of that stream quantified as (1 – a)·(1 – b)·W is the real basis for credit creation (b- is ratio of reserves). Thus amount of the money M_K that confronts the product stream can be expressed as follows:

$$M_K = a \cdot W + \frac{(1-a) \cdot (1-b) \cdot W}{1-k}$$

where k denotes a parameter of credit money creation in banking system. The total stream of money is therefore equal to:

$$M_K = W \cdot WK = W \frac{a \cdot (1-k) + (1-a) \cdot (1-b)}{1-k}$$

The problem of determining a right value of credit money creation parameter k (that minimizes level of inflation) can be solved by use a fragment of the equation of exchange as follows:

$$GDPR \cdot (1 + i) = W \cdot WK$$

Solving for variable (i) we obtain formula:

$$i = \frac{WK}{RWP} - 1$$

where RWP = GDPR/W is the real wage productivity.

Assuming a condition $i = 0 \Rightarrow WK = RWP$ we can find value of the parameter k that minimizes inflation level. Using the equation:

$$a + \frac{(1-a) \cdot (1-b)}{1-k} = RWP$$

we obtain the model:

$$1 - k = \frac{(1-a) \cdot (1-b)}{RWP - a}$$

Thus the wage multiplier is equal to:

$$\frac{1}{1-k} = \frac{RWP - a}{(1-a) \cdot (1-b)}$$

The ultimate opinion is that the stream going through the banking system can be increased to a level W·(RWP – a). The size of credit depends on the wage level, welfare level and productivity level as well.

To keep control over the money supply should only mean a wise wage system and cost control as well as a precise feasibility study in respect to investment projects that involve debt financing in particular. Wages should be derived on a basis of human capital value as discussed by Dobija [2000]. To pay less than average risk rate applied to human capital of an employee is a sin against the individual but overpaying is a sin against society (inflation and depreciation of wage receivables) is a clear conclusion of the consideration.

Problem of money creation is not properly conceived in present monetary approach. Money arises in productive work of employees. This statement should be credited with our attention as one of the fundamentals of money-goods economy. The above formulas only confirm the fact that any amount of credit can be generated, provided that the entrepreneur is able to multiply the invested capital, in other words,

to conduct productive activities. Non-monetary policy is required; apart from that, a strong control over the banking system. Interest rate is an essential market variable, therefore no interest rate policy is needed.

The model of money-goods economy can be generalised; we may also introduce products which do not partake in the goods-for-money market exchange, which are however generated as a result of work, and therefore, according to the production function. These are public goods such as the safety of citizens, i.e. the work of the police and the army, education of children and youths, and so forth.

8. Labour in Economics

It has already been stated that the condition for existence and being of an object is the concentration of energy in it. This energy has to be supplied to the object from one of many sources of energy. Human work can be given as an example of such source. In the business world the expense of an employee's energy can be measured by the means of accounting for labour, taking into consideration human and intellectual capital. The theoretical background of accounting for labour can be presented using well known formulas from physics concerning the concept of labour. Labour is the product of power and time of application of this power. Using this concept, human labour can be measured similarly as in physics. By the usage of vectors, scalars and a Euclidean inner product one can look deeper into that concept.

As commonly known – in physics – labour is a dot product of two vectors: force and distance. Further it can be stated that a vector of distance is a product of velocity vector and a scalar of time of movement. The dot product of force and velocity is equal to the multiplication of the magnitude of quantity of force and the magnitude of quantity of velocity and the cosine of the angle between these two vectors. The product of force and velocity is power. That reasoning can be presented in the form of below formulas:

$$L = \vec{F} \circ \vec{s} = \left(\vec{F} \circ \vec{v} \right) \cdot t = \left(F \cdot v \right) \cdot t \cdot \cos\alpha = P \cdot t \cdot \cos\alpha ,$$

where: L – scalar of labour; $\vec{F}$ – vector of the force (acting in the direction of the movement); $\vec{s}$ – vector of the distance (the distance which is travelled by the point of putting the force); $\vec{F} \circ \vec{s}$ – Euclidean inner product of the force vector and the distance vector; $\vec{v}$ –vector of movement's velocity; t – time of movement (time through which the force was acting); F – scalar of force; v – scalar of velocity; (on the condition that the movement is monotonous, therefore v = *constans*); cosα – cosine of the alpha

angle between two vectors: force and the direction of motion (also between force and velocity); P – scalar of power.

At this moment, it is worth to consider the way of how to measure labour performed by electric current in an appliance, such as a bulb in a lamp. Let us say that the bulb has worked for 20 hours with the nominal power of 150 Watts. Therefore:

Cost of Labour = 3 kilowatt-hours = 150 Watts · 20 hours

As a result of these computations it can be said that electricity had performed labour of 3 kilowatt-hours. Let us realise that, speaking about labour, virtually we speak about the cost of labour as well. The use of electricity will result in getting a bill. This analogy can be brought directly into labour of employees.

Since labour done by workers comes at the expense of their energy in the course of time, the physical formula can be changed into economic one in order to measure the cost of labour. The condition for the proper functioning of that measurement process is the design of a relevant pay system. The economic equation can be presented as discussed by B. Kurek (2004):

COST OF LABOUR = PRODUCTIVITY COEFFICIENT TIME OF LABOUR COEFFICIENT OF SOCIAL USEFULNESS

However, in the case of people and their labour, there is neither such a defined unit of power as Watt nor any angle between vectors. When a person works, the clock-time of work and the productivity coefficient can be identified. The productivity coefficient is the equivalent for the physical and intellectual power. It represents the relation between productivity of an individual and the highest productivity possible and is expressed as a fraction between 0 and 1. In practice it is determined by the applied remuneration system. Since salary is a product of human capital and the rate of return from human capital, than:

$$\frac{W}{W_{\max}} = \frac{u \cdot H}{u \cdot H_{\max}} = \frac{H}{H_{\max}} = wp_a ,$$

where:

W – salary of a particular employee; W_{max} – the maximal salary for the employee with the highest productivity coefficient; u – the rate of return from human capital; H – human capital of a particular employee; H_{max} – maximal human capital of an employee with the highest productivity coefficient; wp – actual productivity coefficient.

The coefficient of social usefulness is the equivalent for the cosine of the angle between vectors of force and velocity. The coefficient of social usefulness is expressed as a fraction between – 1 and +1. For example wise and well prepared teacher works with the coefficient of social usefulness equal to +1, whereas unprepared teacher

works with the coefficient of social usefulness between 0 and +1. therefore formula of labour cost (W) in economics is as follows:

$$\mathbf{W = wp_a \cdot su \cdot \Delta t = wp_e \cdot \Delta t,}$$

where: su – denotes social utility coefficient and wp_e – denotes work productivity of an employee. In real economy wp_e is determined by compensation systems.

Accounting provides convenient language of modelling labour economy. The three accounts: employee's, products' and payables' are sufficient to express labour in terms of the money-goods economy. Let us say that an employee has worked for 280 hours with the productivity coefficient, determined by the remuneration system, equal to 3/5 and coefficient of social usefulness equal to +1. Using the equation for cost of labour we can say that the worker has produced goods spending his energy equal to 168 labour units.

COST OF LABOUR = 168 labour units = 3/5 280 hours (+1)

The cost value of products has increased by 168 labour units. To record this flow of energy we do the first entry (table 6). The second entry stems from the rule of rewarding employee's work. The natural law which describes basic pay system is the adequacy of salary with the value of work, that is the balance of energy flow. Thus the expense of labour, equal to 168 labour units, should be paid back with the same amount, which leads to the book entry of receivables and payables for performed work. That principle guarantees the maintenance of an employee's human capital, social peace, and economic equilibrium. This reasoning allows to see employee's money as receivables for work accomplished by employees. It has to be stated in here that payables, which are equal to these receivables, are of a social nature (solidarity of responsibility).

If later the labourer takes goods valued, no matter by which method, for instance at 12 labour units, then the salary's payables balance of economy will decrease to 156 labour unit and the third book-entry will occur.

Table 6. *Entries expressing money-goods economy*

Operation	*Amount*	*Dt*	*Ct*
1	168	Products	Employee's account
2	168	Employee's account	Salary's payables
3	12	Salary's payables	Products

It should be stated in here that the value of products exchanged on the employees' wage receivables can also be determined both by the market and costing systems. One can imagine that products are sold on a sort of auction on the "purest market". This is one approach. An alternative approach is the use of costing systems. Having organised adequate costing system a price of a particular good can be arrived

at on the base "cost plus". Planned profit margin can be computed taking into regard the cost of risk as discussed by D. Dobija [2003]. However this is not the case in this paper. All socially useful works could be registered in such way. The work of each individual (no matter whether a blue-collar labourer, or an intellectual employee) can be recorded in this way, creating the purest form of goods-monetary economy in which money is abstract and intellectual.

The accounting approach to labour and economy has helped to discern the essence of money-goods economy. Now the role of accounting as the tool system of organising the economy can be easily seen. Banks are part of this accounting system. This form of economy's organisation does not waste people's time on useless of tangible money creation process. Actually there is no need for tangible money at all, since goods' values, receivables for work and etc. are registered by the means of labour units. In fact all accountability relationships can be managed by accounting for labour system. And as Y. Ijiri indicates, *"it would not be an exaggeration to say that our present society is founded upon accountability networks"* [1975, p. IX]. Furthermore, that system enables to compare values of goods according to the contribution of work needed to produce them. Labour units serve not only as accounting units, but also as money units. Moreover, that system gives a possibility to compare work of different individuals. The person who contributes the most to the economy can take the most from that economy.

Dennis H. Robertson [1939, pp. 158-159] deliberates on the logic of British monetary system via an example of the Dialogue on Money between Socrates and Economist. Stating questions on the nature of one British pound ancient philosopher tries to figure out what is the reason for the right functioning of the British monetary system. On the other hand the Economist tries to answer suitably on these difficult questions getting into confusion. In the end of the dialogue Socrates shrewdly notes that behind the proper functioning of the monetary system lies the administration by men of ability and wisdom and not the rules of the Government and the Bank. We have to agree with him, as the Economist did.

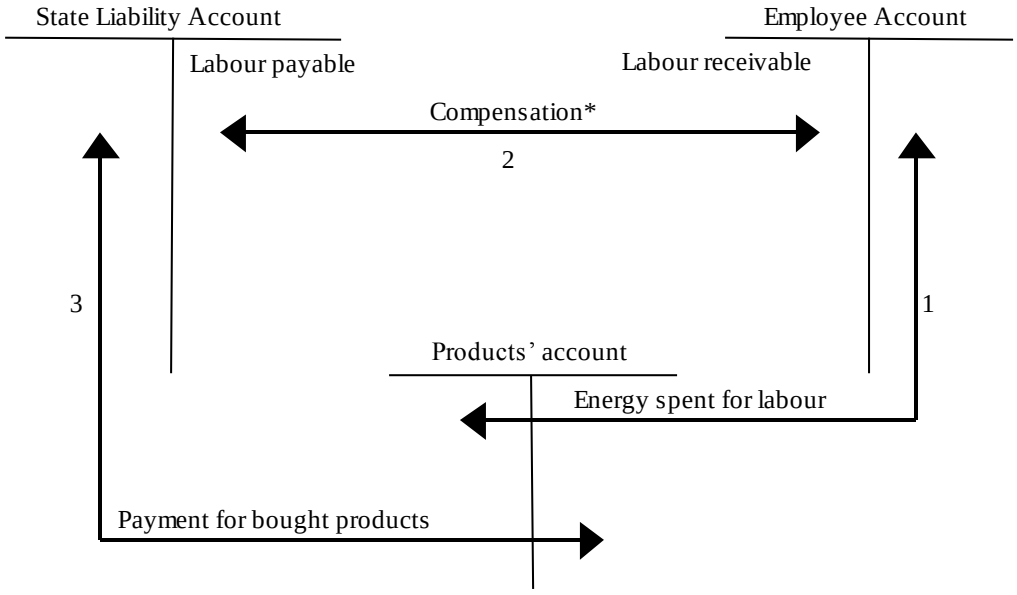
The role of accounting and the system of labour registration can be realised easily while considering isolated, so-called "Robinson Crusoe Economy". Let us say that there is an island, somewhere in the middle of the ocean. Suddenly 300 people are transferred to that island. These people are adults (women and men) and children (girls and boys). There is neither a possibility for these people to escape from that island, nor there is a possibility for outsider to go into the island and bring goods with him or her. If the inhabitants of that island want to obtain some particular goods they have to produce them. It has to be stated in here that these people have the will of life and

want to change the raw environment into habitable one. Some people on the island are able to fulfil the function of blue collar workers, other of teachers, farmers and other of soldiers, etc. The fulfilment of all these functions is essential and necessary in order to facilitate and enable the life on that island.

There is a need to organise economy on the island in order to be able to manage the problems connected to the collective work. There can be many ideas concerning the organisation process. One can advise and suggest that the economy on the island can be based upon the monetary system with shells serving as tangible money. All products would be given value represented by the number of shells required for a purchase of a particular commodity. Someone else claims that they should process ore into metal in order to produce coins. Another person argues that pieces of a particular tree should serve as tangible wooden coins. And again all products would be given value represented by the number of coins required for a purchase of a particular commodity.

It has to be emphasized in here that all these propositions have a great range of disadvantages. The monetary economy based upon the tangible artefacts of money would function; however, it would include many problems inseparably bound up with it. And after all such economy should be deemed as barter one.

Figure 4. *Three Accounts Model of Labour Economy*



*Principle of Compensation = Pay is equal to the value of Labour

There can be another proposition of how to organise the economy on the island – the proposition which takes advantage of goodness of accounting. The economy could

be organised on the basis of double-entry accounting for labour. For such a system the inhabitants of the island need some skills, which are taken as a certainty: communication in a common language, writing, abstract counting, measuring of time. Accounting enables people to divide fairly among them the produced resources. Furthermore, accounting creates the ability of measurement and the common bridge of communication between people who work individually, as well as people who work collectively, in order to multiply personal or other people's resources.

Such an example, of so called "Robinson's island", may sound a little bit artificial, since in the present days it would be rather hard to find such kind of environment on our planet. Especially now, when the Earth is becoming "a global village", many models on internationalisation guide managers and entrepreneurs to become their companies international, giving just an example of the inductive study model – "the Uppsala internationalization model" [Johanson & Wiedersheim-Paul, 1975; Johanson & Wahlne, 1977]. Globalisation being a shift towards a more integrated and interdependent world economy, as defined by Ch. W. L. Hill [2003, p. 6], is from one side a contradiction of isolated island but on the other hand, one might argue that the one huge global marketplace could act as such an island but the island which is very highly developed. However, the globalisation processes are not the case in this paper.

Notwithstanding, the example of Robinson Crusoe's Economy – where labour creates value – may remind people, who were born before the Second World War, the rebuilding and reconstruction of the destroyed towns. Many cities were totally obliterated in 1945, as was Warsaw – the capital of Poland. The devastation was extreme. Despite the fact, that at those times the citizens of Poland did not have any money, the city has been rebuilt in very fast pace. People worked and their labour was recorded not on accounts but as form of confirmation of work done. This form of economy appears again. For instance American town Ithaca uses "hours" as local currency.

It is worth mentioning at this moment that such a process of labour registration, as it was presented at the three accounts model, existed already millennia ago in the Sumer economy. It should be bared in mind that this was the economy which was functioning without tangible artefacts of money. W. Struve [1969, p. 127] explains some parts of the measurement and labour registration processes in the Sumer economy. According to the above mentioned author, the workforce was measured in time units (on a daily basis) and productivity ratios. The working time (e.g. 5 hours of work of a particular person) was corrected by the productivity ratios i.e. fraction smaller than one e.g. 3/5 for a particular person and work [Struve, 1969, p. 152]. That

is how a common calculation unit (man-days) was created. In this sense it created the main function of money.

Polanyi [et. al, 1957, p. 21] writes that Sumerian state authorities kept accounts of equities and liabilities of each individual. These entries would be recorded in the state accountancy, which was the starting point for today's banking system. One member of a society was entitled to take as many goods from the temple's storage as his or her account allowed for. Such an accounting system had a great range of advantages: individuals were not spending more than they have earned, there was no need for tangible money, and the inflation rate was equal to zero since the whole supply of intellectually perceived money was equal to the sum of receivables for work of all members of the society. Goods were valued according to the value of work needed to produce them.

9. Self Financing of Labour. Financing Some Government Spending without Taxes

It has been previously proven that money is created by productive, socially useful labour. In another words labour finances itself. That is undeniable fact because labour is flow of energy into products. In the money-goods economy receivables for work of a particular labourer (which can be understood as "money") are exchanged for the produced commodities.

As commonly known, each country, in order to function properly, needs state officers and administration. It is well stressed by J. A. Schumpeter who said "Bureaucracy is not an obstacle to democracy but an inevitable complement to it" [Microsoft Encarta Reference Library 2004]. Therefore in order to create properly functioning country based on democracy and money-goods economy a number of so-called "budget-labourers" has to be employed. However, on the other side there might be a danger of appearance of Cyril Northcote Parkinson's law. That British political scientist argued that the rise in the total of those employed in the administrative systems tended to expand no matter whether the volume of work were to increase, diminish or even disappear giving an example of the British Admiralty [Parkinson, 1973, p. 5].

In most of countries in the world, salaries of clerks and state officers are financed from the budget of a particular country. The great range inflows into the budget come from the taxes. The appearance of Parkinson's law taken together with tax charges spent on officials' remunerations lead to the waste of citizens' resources. These type of taxes are against the maintenance of human capital, since the compensation for the work done is deteriorated by these taxes and purchasing power of goods is rickety. Goods are valued according to the rules of artificially severe market as discussed by M.

Dobija (2004a). We shall show that the good understanding of nature of capital and labour as well as the money-goods economy allows to avoid some taxes and particularly wage taxation. Then economy turns to efficient state and market can assign adequate risk premium to all participants of market exchange.

In order to illustrate and prove the above presented thesis, let us consider economy described in table 7. Let us say that all of salaries have been conducted on the basis of times of work, productivity coefficients and coefficients of social usefulness. These salaries are consistent with the value of work.

Table 7. *Salary list in economy*

Position	*No of employees*	*Salary [CU*]*	*Costs of labour [CU*]*
Worker	18	1,000.00	18,000.00
Farmer	10	1,000.00	10,000.00
Manager	4	4,000.00	16,000.00
Academic Professor	1	3,000.00	3,000.00
Artist	1	2,000.00	2,000.00
Teacher	1	1,000.00	1,000.00
Deputy	1	3,000.00	3,000.00
Minister	1	4,000.00	4,000.00
State Officer	2	1,500.00	3,000.00
Soldier	2	2,500.00	5,000.00
Policeman	2	2,500.00	5,000.00
TOTAL COST OF LABOUR			70,000.00

* CU = Currency Unit

According to the earlier explanations the above table describes the whole economy. There is no need to organise the tax system in order to reward these so-called "budget-labourers" i.e. *Teacher*, *Deputy*, *Minister*, *State Officers*, *Soldiers* and *Policemen* for their work. Their labour (productive and socially useful), being the expense of their energy, creates value which is placed in the produced goods and services. Work done is registered by an adequate accounting entries according to the model described at figure 4.

According to the formula: **PR = W · WP** the value of product generated in the above economy at assumed 1.5 productivity amounts to:

PR = 70,000 CU · 1.5 = 105,000 CU

Participation of each of the above employees in the product generated is clearly defined by his/her remuneration, without the need to introduce a tax system that would finance the remuneration fund for the Teacher, the Deputy, the Minister, the State Officers, the Soldiers and the Policemen. The share of labour in the product is determined by the index equalling **70/105 = 2/3**. The rest is the share of assets, which always have owners.

The economy presented in the table above is a natural one. In order to function well, it requires equitable remuneration, proper to the value of work, introducing labour norms and controlling labour productivity. Increase in the productivity of labour shall induce the decrease in prices and vice versa. As a result, we may expect a healthy economic equilibrium and proper attitude of citizens, aware of the nature of economic process. An employee receives remuneration according to the value of his/her pay, and therefore he/she creates demand adequate to supply. There is no need for a worker, whose work must find its market rationale in the sales transaction, to additionally provide for his children's teacher's wages. The teacher receives access to the bulk of products by means of her/his receivables for work, even though the results of that work are not directly verifiable by the market; on the other hand, these results are embedded in each worker. Productivity of the worker's and the teacher's labour is decisive for affluence or the lack thereof.

In the present system, in which budget (public) wages are financed from taxes, equilibrium is destabilised in many aspects. Taxes decrease equitable wages below the level acceptable in terms of human capital theory. Excessive, inflation-inducing wages in state budget and industry are compensated by unreasonable decrease in workers' wages, often below the borderline eight per cent rate of return on human capital, which is leading to deprecation of this capital, and to social discontent. Simultaneously, the stream of money confronted with the stream of products is arbitrarily decreased, which distorts the natural market valuation of goods and money[7]. Such market cannot work effectively and economic conditions became too severe.

Continuing with the example presented above, if we introduce a remuneration for state officials financed from taxes, then the tax rate will equal to:

$$TaxRate = \frac{1 \cdot 1{,}000 + 1 \cdot 3{,}000 + 1 \cdot 4{,}000 + 2 \cdot 1{,}5000 + 2 \cdot 2{,}500 + 2 \cdot 2{,}500}{70{,}000} = \frac{21{,}000}{70{,}000} = 30\%$$

The net salaries of employees are presented in Table 8.

Table 8. *Net salary list in the Robinson Crusoe's economy with income tax of 30%*

Position	*No of employees*	*Gross Salary [CU]*	*Net Salary [CU]*	*Money for exchange [CU]*
1	*2*	*3*	*4*	*5*
Worker	18	1,000.00	700.00	12,600.00
Farmer	10	1,000.00	700.00	7,000.00
Manager	4	4,000.00	2,800.00	11,200.00
Academic Professor	1	3,000.00	2,100.00	2,100.00
Artist	1	2,000.00	1,400.00	1,400.00

[7] We can distinguish three types of distortions to natural free market economy: wages non-equivalent to the value of labour, interest rate policy and taxes on wages. Each of the three activities is limiting the free market and moves it farther from perfection.

1	*2*	*3*	*4*	*5*
Teacher	1	1,000.00	700.00	700.00
Deputy	1	3,000.00	2,100.00	2,100.00
Minister	1	4,000.00	2,800.00	2,800.00
State Officer	2	1,500.00	1,050.00	2,100.00
Soldier	2	2,500.00	1,750.00	3,500.00
Policeman	2	2,500.00	1,750.00	3,500.00
TOTAL NET SALARY FOR LABOUR				49,000.00

Now the economy operates with the decreased level of money. In this state of affairs, there are some damaging factors. Products are valued below the fair value of 105,000 CU and therefore market does not assign adequate risk premium to entrepreneurs. Profitability has to go down, too. It is worth to mention at this moment that a non-tax financing system does not generate administrative costs; instead, it introduces balance and justice.

It can be claimed that the aim of a balanced economy cannot lie in decreasing prices below reasonable costs, but in achieving the state of a dynamic equilibrium, in which the market is shaping equitable prices. Therefore, interfering with the stream of money amounts to manipulation, contrary to the free market. Efficient market excludes policies as interest rate policy, exchange rate policy, unnecessary taxes and first of all monetary policy. Only policy of consistency of pay with value of work is requested. It is rather a sort of control moderating under or overpaying than anti market policy.

Summary

The nature of capital as economic energy and natural laws governing its behaviour have been presented in this paper. The theories of labour and compensation consistent with the value of human capital have additionally been developed. The real nature of money being receivables for work has been exposed. It has been proved that the currency unit is in fact labour unit. The wage equation of exchange has been formulated, at the same time manifesting that the monetarist concept based upon circulation of principal amount of money is misleading. Further it has been explained that the source of inflation is inequality between compensation and the value of labour. Inflation disappears if its no further sources appear i.e. too high remunerations comparison to the value of labour. The understanding of the essence of capital, labour and money resulted in the conclusion that labour finances itself, since labour performed denotes inflow of value to the economy. Such inflow may be registered in accounting system via entry of receivables for work i.e. salary. Such type of economy is natural and market may effectively assign value to products giving its participants the adequate risk premium at the relevant risk level in order to be able generate profit.

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