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The performance of relationship between domestic domestic product and unemployment¹

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ABSTRACT

The paper concerns the characteristic of conditions and processes, which permanently influence the unemployment, as the result of domestic product fluctuation. The economic reality determinates the character of the relationship between the domestic production and labour market as the system. It signals, the connection between the two variables depends not only on the domestic product change, but also on a wide spectrum of factors. The variables, representing factors are categorized into groups. Criteria of the division are the affection object - employer and employee and a size of the object. For the system analysis has been applied the system dynamics method. This method lets for an investigation of a high number simultaneously operating and related processes, which regulate reaction the unemployment on the domestic product changes.

INTRODUCTION

The issue of the relationship between the domestic product and unemployment did not find the expression in the present economic literature. In the analysis on the relation between frequent inflation and unemployment the connection between unemployment and domestic product, is accepted as the assumption or basement for the further consideration. The domestic product and unemployment relationship seems to be reasonable, from the economic point of view. Okun's Law states that, in general when the domestic product measured as GDP, or the domestic production index rises, relative to its potential level, then the unemployment (rate of unemployment) should decrease and otherwise, when domestic product decreases, unemployment will rise [1],[2]. The change of unemployment can be caused by a real, and also by an expected change in the total income, or income of a company. When this change is caused by expectations, the real change in unemployment exceeds the change in domestic product, measured by any statistical indicator.

What is the reason for the existence of this relationship? The studied connection has a positive influence on the economic development and growth. It means that even if domestic product declines and unemployment rises the economy can keep balance on the labour market in the long period. So, when an employer effectively adjusts the labour factor to the market situation and the company's capabilities, a domestic product decline less deep will be. Moreover, when these adjustments are quickly performed it is possible to avoid high costs of the surplus employment or losses not realised domestic production. Therefore, the positive character of relationship derives also from the reduction of domestic product gap. The domestic product gap decrease is possible, among other things, through the rise in the number of employed and reduction of unemployment, which is described as the unused labour force.

The permanent domestic product and unemployment relation has a stronger effect on the social distribution of domestic income growth. So, the profit of the income growth is not divided with the same algorithm. The last boom phase of the American economy performance is the proper example. The growing income relatively improved the situation of each social group. However, differences in the obtained income get deeper, in spite of the economic policy, tended to reduce a high differentiation [3]. So, when the relationship exists in the market mechanism, it can be said, the conditions for the entrepreneurship development are satisfied. It is difficult to say if the social profit will be gained. The situation in the labour market improves, in the context of market equilibrium, but the security and certainty of job falls. For the post Soviet societies it is the new style of a life and work. The troubles with the acceptance of quick adjustments regulated by the profit rate cause the lag in, or blockade a free performance of processes. Nevertheless, positive connection for economic system will not get stronger, because of the serious resistance to the transition in the labour market conditions [4].

We have some types of changes in economy fluctuations, caused by different reasons. It is regulated by cyclical economic behaviour, with the expansion and recession phase, structural transition, seasonal and accidental fluctuation.

In the Polish economy, the type of cyclical behaviour has been systematically studied since The Second World War. We can not claim that cyclical economic behaviour started in 1990. Even under central plan totalitarian economy some authors stated echo of specific cycles, in the context of investment processes [5]. In the last decade, these types of changes were a continuation of the previous cycle with a deep crisis in 1990-1992. The variability of economic behaviour is characteristic for the U.S. economy. In Poland this kind of symmetric domestic product and unemployment changes is not crucial, because the intensive restructuring, which is the most important task since 1990 disturbs the free economic behaviour.

Since 1990, especially in the first four years, in Poland the structural transformation process dominated the economy. Obviously, it was caused by the transformation of economic system into a free market system. Significant adjustments occurred in the industrial sector and less in agriculture. Services

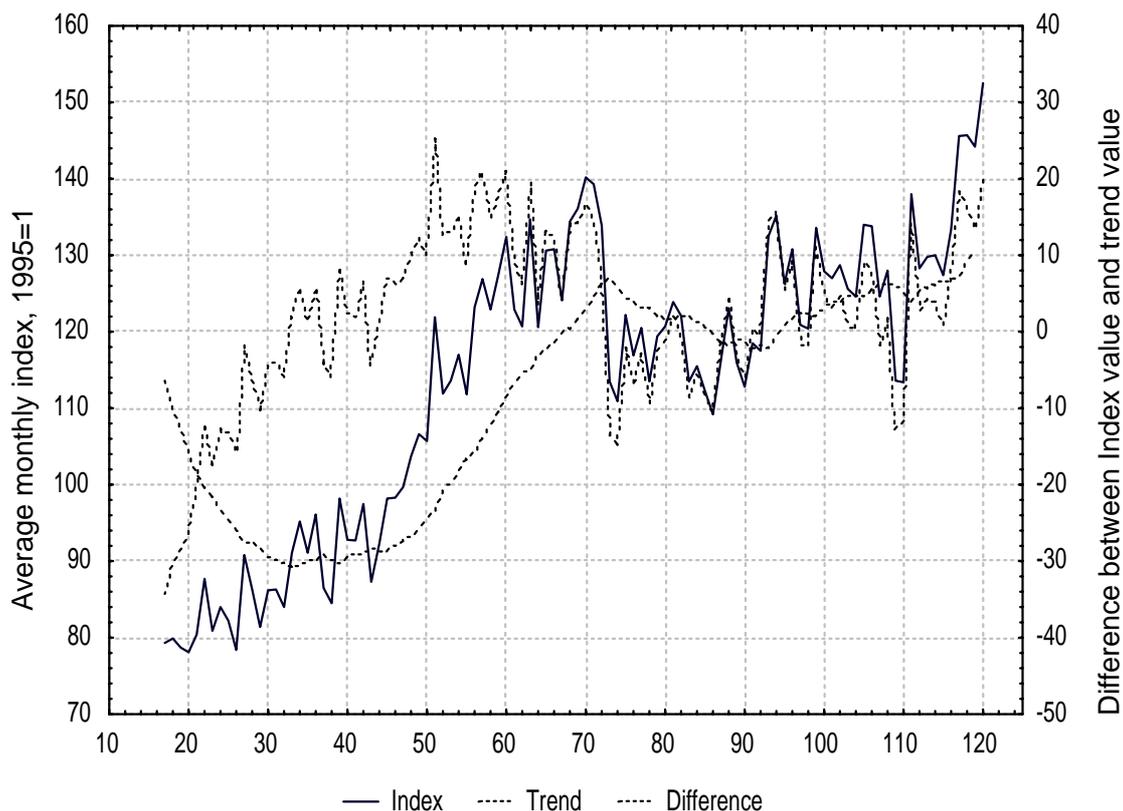
developed very quickly, adjusting to the new conditions and absorbing in part, the surplus of workforce.

A division of two types of changes in cyclical behaviour and seasonal, in statistical data does not give satisfactory results. So, more appropriate is an analysis of real data, which is seasonally adjusted.

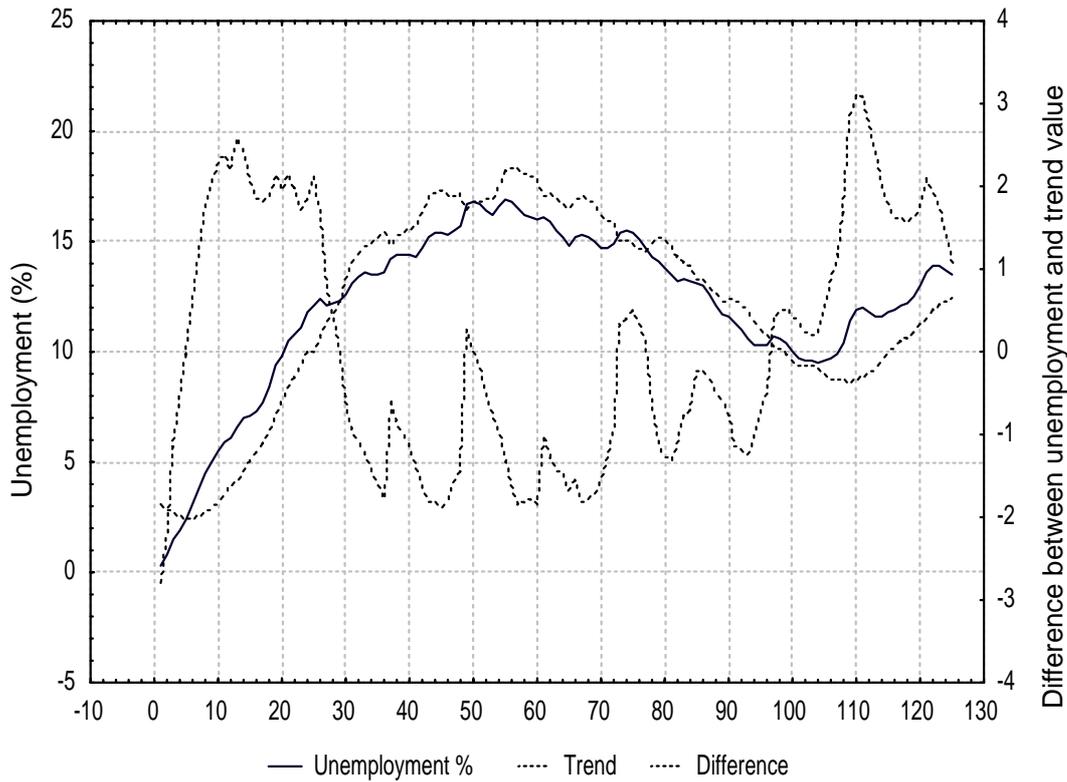
Graph 1 shows changes in the industrial domestic production index. This kind of measurement is used to show fluctuations in performance more precisely than the aggregated GDP coefficient. The reason for using this type of index is higher sensitivity to the domestic production sector on fluctuations in overall activity. This makes it possible to show economic situation more precisely [6].

Graph 2 shows changes in unemployment level, seasonally adjusted.

Graph 1. Index of industrial production (May 1991 - February 2000)



Graph 2. Unemployment (%) [January 1990-June 1999]



Source: Calculations based on Central Statistical Office data [6],

So we can ask, it is possible, that the relationship had taken place in the formative market system. As we can suppose, the relationship will not be significant. But the progressive reduction of obstacles for impulse flow will accelerate and reinforce such processes like employing and dismissing.

Now let us look at the calculation results. Table 1. shows that the strength of the relationship oscillates, as a measure of the correlation coefficient, in different highly developed countries.

Table 1. The correlation between unemployment changes and increase of the real GNP in period 1965 - 1993

Country	Italy	Germany	Great Britain
Correlation coefficient	-0,45	-0,78	-0,52

Source: M. Burda, Ch. Wyplasz: Makroekonomics [8], p. 20

So, in the case of one country the feedback domestic product - unemployment is stronger, in the other country is week. For Poland the correlation coefficient

between the number of differences (see the graphs 1,2) is -0,4. It means that from the statistical point of view this connection level is not important.

This different relationship connection suggests, the existence of unemployment reaction process depends on a composed feedbacks system. The process of the domestic product - unemployment influence is possible, when the selected factors transform the change in domestic product on processes responsible for the change in unemployment. The system of the reaction process depends on:

- number of factors, which determine process performance,
- scale of factors influence,
- amplitude and frequency of the value variation.

Moreover, we can expect the relationship existence, when the basic and additional conditions are realized.

The change (increase or decrease) of domestic product implies changes not only in labour stock (number of workers). This change can also be reflected by adjustment in sum of working time and earnings of workers. In the model a mechanism of the unemployment reaction consists of economic processes which directly determine a level of such variables as:

- rate of unemployment,
- number of jobs,
- period of job search,
- wage /salary.

Processes, presented in the model as the number of feedbacks, generally perform in advantageous, or disadvantageous conditions. Moreover conditions form the background for the existence of relationship.

The basic conditions are created by the political, economic and social system. From the U.S. experience and Western Europe countries it derives that the most favour political system is democracy, with the triple structure of the authority; legislative, executive, jurisdiction. This kind of political system favours creation and performance of the market system, which reinforce relationship.

However, pure market system does not exist in the world. The choice related issue is the scale of modification of free market system. The mentioned choice is usually determined by the definition of the State interference. As the U.S. and Polish examples show, the level of the State interference is far differentiated and has the significant influence on conditions creation for the relationship performance. In the U.S. the level of interference can be described as "discreet", in a free interpretation. The optimal economic policy seems to be watching and taking care over the correct processes performance. It means that the authority such as Government, Congress and Bank of Federal Reserve, through their decisions correct the market mechanism, in order to attain the balance and growth. In general, market participants, producers, consumers are responsible for the welfare growth. The state through the power distribution creates requirements of society. Perhaps because of this, the American society seems to be very active in the participation in the market behaviour. This activity means

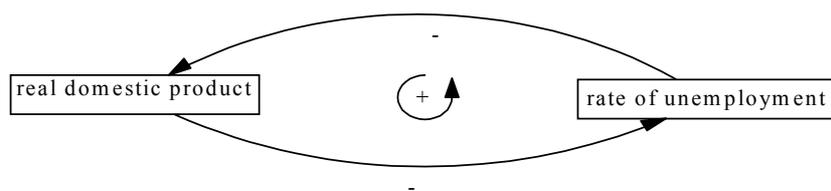
the permanent care over society's life status. It is necessary to mention a high coefficient of the labour activity, self-employed, and the entrepreneurship in relation to Poland and the European Union countries [9].

Among other things, from the historical reasons, the Polish economy significantly differs from highly developed economies. The participation of a State, measured as the level of income redistribution is by far wider than in the U.S. We can explain it by the fact that the present transition requires the direct initiative, activity and co-ordination of economic policy in order to restructure the economy in different fields and the still intensive adjustments the domestic production and services to the world market requirements. According to senior professor W. Wilczyński and others, the state interference should be gradually limited, while the necessary reforms are being implemented [10].

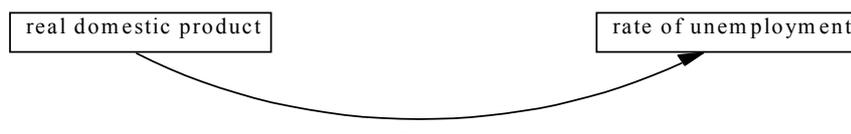
The duration of transition process shows that the synchronised reaction of the domestic product and unemployment is less inevitable. When the U.S. market mechanism creates the stable background for the reaction of unemployment, the Polish system does not support the undisturbed processes behaviour. In general, the conditions for strong feedback domestic product-unemployment are still in creation phase [11].

Theoretically, in the case of domestic product to unemployment relation we have the positive feedback. If a domestic product creates change in unemployment it gives an impulse to implement changes in the labour market, but in the next period the changed unemployment level affects the domestic product. So, in the simple version of analysis the relation domestic product - unemployment will be the positive loop with two variables and two negative feedbacks.

Scheme 1. Domestic product - unemployment loop



Scheme 2. Domestic product - unemployment feedback



When the above mentioned system forms favourable conditions, selected processes cause the unemployment fluctuation. Generally, a change in domestic

product (p) does not derive from changes in unemployment (u), $p \neq f(u)$, but $u = f(p)$.

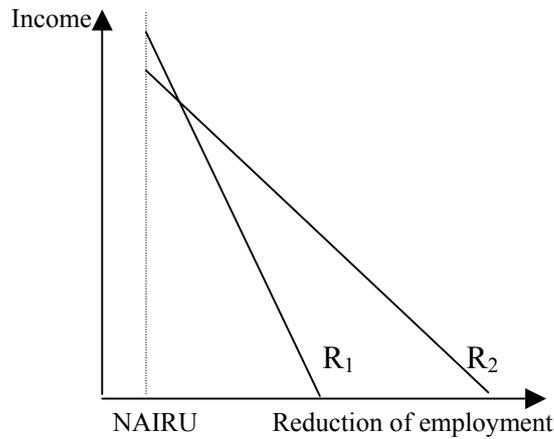
The assumed loop (Scheme 1.) is more possible in theory, than in practice.

The problem of the domestic product variation is considered in theories of growth, economic and political cycles, theory of expectations. Most of these theories suggest that the domestic product causes the unemployment fluctuation, (Scheme 2) [12].

The only one and rather rare situation of high unemployment and a low domestic product gap, will probably decrease the domestic product. Through intensification of the fiscal policy it is possible to obtain an increase in redistribution effect. But the existence of unbalanced labour market, and the high real income level can result from the external factors, such as an intensive foreign labour inflow, or development of capital intensive industries. The domestic product decrease can be caused by imposing higher taxes, which indirectly forces producers to bear the costs of the labour supply surplus.

When the level of the state interference is low, possibilities for correction labour market and social inequalities are narrow. In such a case, companies transform the variation into domestic product on labour factor through the optimal and rational adjustment of the domestic production scale and the whole size of plant [13]. The scale of this transformation varies and depends on subject of the analysis. In the case of a single company's reaction, changing unemployment after, or during the domestic product fluctuation, is by far quicker and more fluent than this reaction in the total economy. The lag in the rate of unemployment reaction occurs, when workers are employed at more than one workplace. Moreover, the number of jobs depends on the overall number of births and deaths of enterprises. This clearly reflects the dynamic nature of job market. The net effect of births partly explains the slow decrease of employment and growth of unemployment. This difference is shown below, (Scheme 3.).

Scheme 3.: The lag in the total rate of unemployment reaction



R₁: The total economy reaction,
R₂: The company reaction.

The level of the connection between the domestic product and unemployment changes in the period of observation. Therefore the relation is usually non-linear. The correlation coefficient shows only the average level of this connection, characteristic for a given economy. Therefore, for the more detailed investigation of this relationship the model approach presented below, is required.

The system and a single process are dynamic, because of the fluctuation of level and frequency of factors. Factors, named in the model variables, are classified by the object of effect and by size of the object. The classification of variables, in accordance to these criteria is shown in Table 1.

Table 1.: Variables defining the reaction of unemployment assembled into groups, in accordance to criterion of side and size of the object

Employee side reaction		Employer side reaction
Unemployed person	Rate of unemployment	<ul style="list-style-type: none"> ▪ elasticity of work. work-law, labour cost, minimum wage, trade unions ▪ expected and present profit of economic activity, ▪ domestic productivity, technological progress, net number of firms, ▪ level of income redistribution, ▪ investment and consumption demand, inflation rate, interest rate
<ul style="list-style-type: none"> ▪ internal, spatial, occupational mobility, entrepreneurship, self-employment, ▪ education, qualification, ▪ activity in searching for work 	<ul style="list-style-type: none"> ▪ labour market conditions, period of searching for work, number of job offers, supply of work, ▪ relation of the unemployment benefit to the wage or salary, ▪ period of receiving the unemployment benefit, the social security, ▪ effectiveness of the active labour policy 	

Source: Autor's classification,

When the domestic product decreases, for the support of the relationship, variables which describe an employer decision about delimitation of work-time and number of employed, are more significant. The relationship will be significant, when the labour law will allow adjustment of the labour stock. The employers are at liberty in recruitment, so they should also have no difficulties with the layoffs.

In the case of domestic product increase, the reaction should be concerned on the workforce side. Mobility, labour activity, entrepreneurship are the important variables then. The higher the value of these factors is, the higher the participation of society in income creation.

The classification of variables concerning the size of the object divides factors of the employed side into two groups. In the first variables group the object is single person. Here we have variables: mobility (spatial, occupational), education, entrepreneurship, self-employment and activity in search for work. This kind of activity depends on the predisposition, but is also regulated by situation in the labour market.

The second group of classification concerns variables determining the total economy change in unemployment. These variables are: period of work search, number of job offers, relation unemployment benefit to wage or salary, possible to receive and appropriate to qualification, period of receiving the unemployment benefit, the social security discouraging unemployed from the

legal employment, the overall supply of work, the effectiveness of the active labour market policy.

In the group of employer's side factors, we have no variable determining the reaction of single person. The way of reaction is rather common for all employers because market conditions for firms are common for them.

The positive changes in the unemployment call out increase of the employment probability. Why not in the number of employed? The unemployment and employment are parts of the labour market. The sum of employed and not employed, but searching job is the value of work supply. However, the change of unemployment into employment is not equal. In Poland, besides the outflow of discouraged people to a stock of passive labour force is the distressing large grey area of employment, not visible in official statistics. This is the example of phenomena of official statistics deformation which are typical in majority of modern countries. The experimental investigation of grey area in Poland was carried out The Central Statistical Office in 1995. In the group of 25.6 thousand respondents, 8.6% worked in the grey area [14]. The change of employment into unemployment is also related to uncontrolled unemployment increase. The major part of the unregistered unemployment concerns agriculture. This sector absorbs people who lost jobs mainly due to restructuring. Thus high unemployment in agriculture consists of farmers and immigrants from cities.

One of the graphical presentation method for systems applied here is the system dynamics method, used for the relationship's analysis. Created loops and feedback describe the mechanism of process behaviour in a complex approach [15].

The selected variables are of permanently character existing, in the system. So, the influence is changed by the fluctuation of a variable value.

The definition of the system shape derives from studies, based on the Polish and the American economies. The graphic model, presented below, sets the common for free market economies composition and mechanism of the analysed relationship.

The model is the fragment of total economy system. The attribute "dynamic" means that the assumption *ceteris paribus* is not taken into account. All variables change simultaneously. The fluctuation of one variables derives from the rest variables changes [16]. The relationship between the domestic product and unemployment is analysed only in the market system, with the limited State interference. The society behaviour results from variables value of the employer side. The application of system dynamics makes it possible to understand the complexity of the real economy system and to answer the question, what factors and processes are responsible for synchronised reaction of unemployment to domestic product changes. The graphic scheme, presented below shows the way of connection variables, mentioned above. These feedback's series can also be considered to be the structure of process. The graph model of domestic product — unemployment relationship performance, presents the above mentioned concept of impulses flow. From the left side, we have the group of variables

(stock, flow and information variables) describing the domestic product sphere. In this part of scheme the following issues are included;

- process of job creation,
- process of employment regulation in companies,
- income fluctuation, regulated by aggregated economic variables monetary, fiscal policy and demand.

According to Scheme 2, variables of domestic product group should influence the unemployment group variables. On the right side had been placed variables unemployment group, describing the labour market system. Processes which flow through variables mentioned group (see Table 1) are recruitment and layoff processes. The behaviour of these processes is related to both, labour market and domestic product factors. Therefore, the existence of the relationship between domestic product and unemployment is possible. The domestic product variable is regulated by a number of variables. Variables like taxes, number of firms, labour costs, and etc. (see Table 1), influence the unemployment and transform a sum of money into number of work places, employment and in the next into a jobless people stock. The important regulator is a sum of income of economic activity, which is included in model as the important factor, which regulates decision concerning the labour stock in a company and increases the domestic product stock. The level of domestic product can influence regulator income of economic activity by existing business expectations and economic climate.

In reality the analysed relationship performs like a system. Therefore the system dynamic method seemed to be an adequate one and helps to understand this complex mechanism in a better way.

REFERENCES

- [1] A.M. Okun: *Prices and Quantities, The Macroeconomic Analysis*, Wydawnictwo Naukowe PWN, Warszawa 1991;
- [2] M. Prachowny: *Okun's Law, Theoretical Foundations and Revised Estimates*, "Review of Economics and Statistics", vol. 75, no 2 [May 1993];
- [3] M. Sulmicka: *Poverty in The United States of America*, Polityka Gospodarcza, [nr 3/2000];
- [4] A. Ziomek: *Fluctuations in domestic products on unemployment and employment*, Lubniewice 2001, paper under publishing procedure;
- [5] J. Tarajkowski: *Sectoral production function analysis for Grand Poland region industry 1961 - 1966*, Researches of Institute of Regional Economy ,ed. S. Kruszczyński, Poznań, 1968.
- [6] R. Barczyk, Z. Kowalczyk: *Methods of economic behaviour investigation*, PWN, Warszawa-Poznań 1993;
- [7] Statistical Yearbooks of The Central Statistical Office, 1991-1999;
- [8] M. Burda, Ch. Wypłosz: *Makroekonomics*, PWE, Warszawa 2000;
- [9] R.W. Bednarzik: *The role of entrepreneurship in U.S. and European job growth*, Monthly Labour Review, [July 2000];
- [10] W. Wilczyński: *Way out of polish economy crisis*, PWN, Warszawa-Poznań 1992.
- [11] A. Ziomek: *The state influence on the domestic product and unemployment relationship in Poland*, Zeszyty Naukowe, Akademia Ekonomiczna w Poznaniu, paper under publishing procedure;
- [12] R. J. Barro: *Makroekonomics*, PWE, Warszawa 1997;
- [13] J.S. Franklin: *Industry output and employment*, Monthly Labour Review, [November 1999];
- [14] M. Kałaska, J. Witkowski: *Jobs in the grey area in Poland 1995*, Gospodarka Narodowa, [nr1-2/1996];
- [15] J. Polowczyk: *Regulation mechanisms influence on economy plans realization in system dynamics approach*, Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań, 1992;
- [16] M. Ruth, B. Hannon: *Modeling Dynamic Economic Systems*, Springer-Verlag, New York, 1997;

The supplement 1

Graphic model of the relationship domestic product — unemployment performance — point of reference for further discussion.

Mathematical model will be available on the request during the conference.