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THE MAIN WAY OF REFORMING PROPERTY – CONSOLIDATING THE PRIVATISATION PROCESS

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Abstract:

Representing a basic element in restructuring the economy, privatization must not be seen as an aim in itself or as an ideological axiom; it represents a logical component of a much wider reform programme, the dimension and sequence of the various stages and measures of the reform influencing its nature and perspective of success. The economical and social significance of privatization must be assessed by relating it to the economical efficiency, respectively to the extent by which it supports its increase on the long run.

The essential and fundamental condition of turning to the market economy consists in the economic agents' decisional autonomy, which is indissolubly connected in its turn to the problem of property. Therefore, the main way of reforming the property consists in consolidating the privatization process, the two concepts being closely related to one another, so that privatization cannot exist without privatization.

Key words: *property, privatization, reform.*

1. Introduction

The meaning we give to the privatization term is that of total or partial civil circuit transition of the production means that are in the property of some economic agents such as the state, into the property of some economical associations of private feature and individuals, under the conditions of a market with various degrees of freedom. By introduction in the civil circuit we understand a free circulation of the production means on a market where the price is formed freely based on the convergence between demand and supply.

Privatisation does not form a purpose in itself. The economical and social significance must be assessed by relating it to the economical efficiency, respectively to the extent by which it supports its increase on the long run.

Restructuring the economy represents the quintessence of transition, being also called the true reform, meaning the assembly of the transformation processes of the real economy, the only one to sustain reaching the targets of transition in the assembly of economy (Drăghici 2004).

Restructuring implies measures of restructuring the property, the banking system, tax system, a structural reform by changing the share of the branches and sectors, creating the markets and the social protection system.

The reform of property is the core of transition to market economy and the manner how it develops represents the instrument board of the assembly of the transformational processes. The form of property refers to the change of the property structure, to the property transfer from the state to the individual (Banu 2010).

The expected effect of the property reform, which has privatization at its centre, is the formation of the agents of the new society, promoters and operators of its specific interests – the economical class, capitalists, entrepreneurs, the new bourgeoisie on the one hand, the middle class, supplying the social balance and distributing the prosperity and the wage class on the other hand.

Privatization keeps its position as core of the social-economical reforms, in those countries free of the tough constraints of planning.

Privatization represents a world phenomenon encountered in developed Western countries (France, England, USA, Japan, Italy etc.) as well as in developing countries in South America, Africa, Asia, etc.; for the countries of Central and Eastern Europe, privatization forms a decisive element for the economical-social reforms for creating an economy based on the market demands (Clifton, Comin, Fuentes 2003). By analyzing the various cases and experiences of privatization in a series of countries, we deem that in Romania's situation the compliance with some basic requirements should also be

taken into account, in order to obtain corresponding economical-social efficiency after this process (Lefter 2006).

2. Goals of privatization

From a political point of view: The emergence of the entrepreneurial class leads to the occurrence of capitalists' class, the most difficult part having been the social transformation within property;

From an ethical point of view: Returning the property to those who have been dispossessed by nationalization; it is difficult to set forth the rules that must be complied with when returning the property. From a legal point of view, it is not a unanimously accepted solution regarding retrocession. A true psychosis has been created in our country regarding the retrocession, forgetting however the true force and the most efficient way to get us out of trouble would have been to create the new property, which would have led to the efficiency of assigning the resources into the economy, in private regime;

From a financial point of view – a method by means of which the budgetary incomes would be supplied and the use of savings available from the public (through stabilization). The extent of saving is very high, as well as the availabilities to investments.

3. The basic principles of privatization

By analyzing the content of various normative acts governing the privatization process, as well as the actual situations of privatizations in a series of developed countries, there results a series of basic principles taken into account.

1. Complying with the state's patrimonial interests

Starting from the fact that the patrimony of an enterprise that is privatized represents a part of the country's national wealth, special measures are stipulated in order to provide a more realistic assessment of those respective units, under the conditions of total impartiality.

2. Protection of national interests

In some countries, such as France, a maximum limit of the total amount of the directly or indirectly given titles by the state to foreign natural or legal entities or who under foreign control. We state that this limit (in France a maximum of 20%) may be decreased through decree of Ministry of Economy, Finance and Budget if this is demanded through the protection of interests.

3. Total transparency of actions regarding privatization

All actions related to privatisation of an enterprise must be performed under the conditions of accordingly informing and advertising for the public willing to be part in the privatisation process. Also, by willing to provide a complete equality between those purchasing shares and for removing the occurrence of some masked privileges for some participants, strict procedures are set forth for selling the shares, transfer or exchange of securities, sale or abandonment to the preferential subscription right, etc. (Hancké 2002)

4. Development of people's shareholding

State's interest is that of allowing the development of a popular shareholding, respectively to provide the conditions of having as many natural entities as possible participating to the privatisation process. In this regard, measures concerning the following are set forth:

- encouraging the popular shareholding for the employees of enterprises that are in course of privatisation, as well as for the other categories of the population;
- state's compulsoriness of proposing to the employees of the enterprise, as well as to former employees of that respective unit, if they had worked at least 5 years within the enterprise based on a labor contract, purchase, under preferential conditions, up to 10% of the shares the state gives;
each employee's opportunity to request the purchase of shares, under preferential conditions, up to the limit of a fixed amount, normally a maximum of five times the annual limit of one's contributions to social security;
- preferential conditions for the employees of the unit purchasing shares; decreasing the price of each share by 5%, without the obligation of further keeping those respective shares; reduction of the price of the purchased shares by up to 20%, however, the employees being bound to keep those shares at least 2 years as of the purchase date; delays regarding the payment of the

purchased shares, up to a term of 3 years, a period when those securities are blocked until the purchase price is covered completely; remittance of certain free shares – for each share purchased directly from the state a free share is assigned, by binding the employees to keep them one year at the most as of the reception date;

- exemptions from taxes and social contributions for the advantages assigned.

Popular shareholding is also favored through the fact that a limit of 5% regarding the shares given by the state through the procedures of the financial market may be imposed for any legal or natural entity; thusly, several applicants have the opportunity to purchase securities (Bulent 2002).

5. *Acquiring additional financial resources by the state*

The net amounts collected by the state are normally used for paying certain debts incurred by the state, as well as for providing with capital the enterprises remained in the public sector.

6. *Breath of public sector*

This principle aims the reduction of the number of units in the public sector, as consequence of privatization.

4. Economists' conceptions and opinions regarding the privatization

“The essential and fundamental condition of turning to the market economy consists in the economic agents' decisional autonomy, which is indissolubly connected in its turn to the problem of *property*. All decision factors in the former communist countries are unanimous in assessing that privatisation is the *self-qua-non* condition of the transition to the market economy. Western scholars and specialists also confirm this conclusion, assessing that privatisation and restructure of the enterprises represent the “heart of the economy transformation process” (Fischer, and Gelb 1993).

One of the defining features of the monopolist system – state of dictatorial type consisted in the depersonalisation of property, its most striking manifestations being the restriction of the economic activity through a vast network of administrative-bureaucratic regulations – hyper-centralised planning, emphasised “budgeting” of the economy, the arbitrary intervention of the state apparatus in the operation of the units, abandoning the managerial competence criterion in selecting and promoting the managerial personnel. Based on property, the direct employment of responsibility of economic agents is crucial for implementing the economic mechanisms. This implies establishing a direct and explicit connection between the *object of property* (by means of its elements: possession, use, disposal, usufruct) and *subjects of the society*, represented by individuals. This is the main content of privatisation. Regarded as such, *private property* must not be reduced to one or other of its possible forms (Bari 1997).

In a broader sense, *privatisation* represents the transfer of public assets and services from the “hands of the state into the private ones”. As a result, it implies activities ranging from selling some *state owned enterprises* to accomplishing public “services” with private contractors. The problems related to privatisation are deemed as being manifold, including problems of financial features, property rights, legislation and especially in the political domain, besides the aspects of general economic feature. Generally, it opines that political factors are the ones determining the rapidity or deceleration of privatisation and that any privatisation strategy requires the development of a programme mobilising political coalitions favourable for privatisation, powerful enough to overcome the opposition of some groups of interests (Hanke 1992).

Privatisation is a complex process which is achieved through multiple methods and procedures.

In Western countries, the delimitation of the *state sector* was done under the conditions of the mighty powerful market, the predominance of *private property*, under certain sustainable and uninterrupted democratic tendencies.

In former communist countries, the situation was entirely different: the economic, social and political environment was fundamentally different, and the two parts of Europe were and unfortunately still are two distinct worlds. In the Eastern part of our old continent, the *private property* was not the majority, but the *state property* was (at the beginning of 1990 – the state property was between 75% - 95% for the whole economy of the Eastern European countries), and the mechanisms specific to free market economy were entirely absent. Even the nature of the state property itself was different from the Western one, which represented one of the aspects that obstructed privatisation to the greatest

extent. It was a matter about the so-called *property of the whole nation*, a diffuse property, which in fact belonged to no one.

Although they were under communism, people maintained their property instinct and those responsible with the destinies of the economical units and their management did not know precisely what their rights and responsibilities were, deriving from this form of property. Property was not explicit, but it was deemed as being implicit and for precisely this reason the just assessment of this patrimony was never done; and when the communist system collapsed, who knew precisely what the value of the components of state property was?

After the revolution, there existed (and unfortunately, it still exists) a stage where it was attempted to adapt the mentalities to both the enterprise leaders and employees, upon the requirements of the free market.

The 45 years of over-centralized economy led to an overwhelming increase in the economic disparity and living standards between Romania and developed countries of Western Europe.

The first 3 years (1990-1992) – systematic transformation in Romania – represented a major collapse in the plan of economic growth. The Gross Domestic Product dropped by 5.6% in 1990, by 12.5% in 1991 and by 8.8% in 1992, and the industrial production virtually collapsed. -23.7% in 1990, -22.8% in 1991 and -21.9% in 1992. If we take into account the fact that the agricultural production of 1990 has also dropped by 3%, in 1991 by 2.2% and by 15.2% in 1992, we get the partial image of a situation which some economists have justly compared to the great economic depression in 1930, and others have even considered as being “the greatest peacetime economical collapse in the history of Romania”. The natural consequence of this macroeconomic involution, Romania’s share in the world production has dropped to almost half and it is certain that the premises of transforming our country into a country with a market economy have not been the most favorable ones.

If we were to list the main features of the Romanian economy of that time, we may affirm that:

- the structure of the economy had been emphatically directed towards the production of means for investments;
- national economy had become strongly dependent on imported raw materials and power resources, balancing of the external flows requiring large exports, mainly directed towards the C.M.E.A. market, as well as towards the developing countries;
- the decrease of the industrial production, as well as of that intended for investments were an important step towards returning to a structure of the economy that would meet the solvable demand.

A complex programme of reforms is currently in first progress in Romania, which is meant to transform the country into a market economy. A set of institutional reforms has been put into practice, which has contributed to the substantial reduction of the state’s role in economy.

The changes during recent years, by using the mechanism of prices, exchange rate and interest’s rate for assigning the resources into economy have been undermined by the disruptive structural problems, also including the lack of economic agents’ financial discipline.

The stage between 1992-1996 had as main goal the economical macro-stabilisation and reduction of inflation, by combining the monetary and financial policies with an accelerated process of privatisation and restructuring of enterprises in the state sector, trying to stop the economic decline during this stage.

By taking a look not too far back in the past, it would seem that the critical stage of the transition in our country was successfully passed, but the enormity of the stock production and making the foreign trade balance deficit chronic, as well as the occurrence of the inflationist tensions determine us to assign a negative response to this important issue which Romanian is facing. For a certain period of time, privatisation also stagnated because the foreign investments did not register by far the expected levels.

In between 1996-2005, the situation of post-revolutionary Romania has the following basic features:

- firm option for a new system based upon the principles of market economy;
- compliance with the pluralism, private property and democracy, in concordance with Western values;
- supporting and encouraging the formation of a strong private sector, able to accelerate the development of Romanian economy towards a genuine market economy;

- adopting a set of laws indispensable to market economy, consistent with the legislation of the European Union;
- triggering the mass privation process and the establishment of some institutions indispensable to it (Stock Exchange, Mutual Funds, Investment Funds, OTC Market – *over the counter market*), etc.;
- slow and incoherent restructuring of some vital sectors in the Romanian economy;
- the emergence and proliferation of the financial blockage – a consequence of perpetuating the state monopolies, stock production and state economic agents' financial indiscipline;
- liberalisations of prices, salaries and interests, as measures to stimulate competition;
- liberalisation of foreign trade and adopting a national policy to attract foreign investments;
- reform of the banking system and modernisation of the market system;
- privatisation of agriculture (in a ratio over 80%);
- reform of public finance;
- registering some progresses in the macro-stabilisation process;
- population's reduction of the purchase power and living standards;
- clear will of integration into the European Union structures, a desideratum which is supported by over 90% of the Romanian population (according to some surveys performed).

In the transition process to a genuine market economy, the transformation of the property structures represents one of the fundamental elements of the reform. The Romanian private sector has developed through two ways:

- by creating new companies through direct investments, including from the participation with foreign capital;
- transfer of some whole enterprises or parts of them from the state property towards the private sector.

In the branch of industry, its priorities were:

- supporting the adjustment of large enterprises from the most inefficient industries which had not immediate privatisation perspectives, with financial problems and which did not represent a low extent of using the production capacities and which had a significant share in occupying the labour force in a given region;
- creating the basic infrastructure: Power and water supply, transport and telecommunication networks;
- support for professional training (including for professional re-training and re-conversion);
- supporting the export, in general, based on the principle of "neutrality of stimulants between industries".

Regarding the agriculture, even since the first 2 years after the revolution, it represented the domain which was given the greatest hope for rapidly exceeding the crisis state, being deemed the sector that shall take over most of the labor force surplus that was to migrate from the industrial sectors affected by unemployment. Passing from the cooperative and state property form to the private property form required an intense legislative process, an action which we deem it is performed even at this time, due to the continuous changes that occur.

A series of normative acts have been adopted, being deemed indispensable laws within the activity in agriculture, such as: land law no.18/1991, a law which has subsequently been subject to some fundamental amendments; law no. 36/1991 on agricultural companies and other forms of association in agriculture, subsequently being also subject to amendments; law no. 68/1991 on the agricultural register; law no. 83/1993 on the state support granted to agricultural producers; law on farming no. 16/1994; law no. 34/1994 on the agricultural income tax; law no. 75/1995 on production, quality control and trade of seeds, as well as other laws that appeared subsequently.

As with the other activity sectors of national economy, the lack of a genuine agricultural policy had devastating effects onto a vital sector for the success of the transition to the market economy and for Romania's accession into the economical structures of the European Union.

5. Conclusions

To a certain point, the economic theory did not have available a certain and practically verified pattern for the transition from a nationalized, ordered economy to a market economy. For this reason, privatization appears as being an extremely complex process that is performed through multiple ways.

The process of privatization and change of state property content does not exclude grouping the economic units, provided that the anti-monopoly legislation is complied with, based on free agreement, determined by the unit of interests.

References:

- [1] Niță, D. 1995. *Economia politică*, Editura Economică, București, in *Romanian*.
- [2] *Privatizarea – metodologie și practică*. 1994. Colecția „Ghid profesional”, Editor Tribuna Economică, in *Romanian*.
- [3] Banu C.E. 2010. *National and International Regulations on Property Right*, Journal of Advances Research in Law and Economics, Volume I, Issue 1(1), Summer, 2010, 4 - 12.
- [4] Bal, A. 1997. *Economii în tranziție*. Europa Centrală și de Est, Editura Oscar Print, București, in *Romanian*.
- [5] Ioviță, M. *Tranziția la economia de piață*. Editura Economică, București, in *Romanian*.
- [6] Milanovic, B. 1990. *Privation in post – Communist societies in transition*, International Monetary Fund Review, September.
- [7] Fischer, G., and Gelb, A. 1993. *The Transforming Processes of Socialist Economy* – Washington, Martch.
- [8] Bari, I. 1997. *Economia mondială*, Editura Didactică și Pedagogică, R.A. București, in *Romanian*.
- [9] Hanke, S.H. 1992. *Privatizarea și dezvoltarea economică*, Editura Expert, București, in *Romanian*.
- [10] Clifton, J., Comin, F., Fuentes, D.D. 2003. *Privatisation in the European Union: Public Enterprises and Integration*, Kluwer Academic Publisher.
- [11] Hancké, B. 2002. *Large Firms and Institutional Change – Industrial Renewal and Economic Restructuring in France*, Oxford University Press.
- [12] Bulent, S. 2002. *Legal Aspects of Privatisation: A Comparative Study of European Implementations*, Editura Dissertation.com, USA.
- [13] Lefter V. 2006. *Privatizarea – profesionism și transparență*, Revista Economie teoretică și aplicată, Academia de Studii Economice București, in *Romanian*.

EUROPEAN FUNDS – A SOLUTION FOR THE ROMANIAN ECONOMIC RECOVERY

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Abstract

In Romania, the economic agents are used to excessively consume raw materials and energy without ensuring, in compensation, the corresponding added value. Thus, it is no wonder that the insolvency is a frequent phenomenon. Another problem of Romania's economy is determined by the improper costs/prices- profits report, correlated with the supply and demand of the market. If the firms do not take into account the laws of the real market, the risk and the profits, they will not be able to avoid insolvency, since the economic decisions, often disastrous, will continue to promote inefficiency. Many factories are temporarily insolvent, even if they function properly, because their partners have delayed the payments or haven't respected the contract by delaying the deliveries of parts, raw materials and services. When the mechanism of taking/profits and payments is blocked because of the lack of cash at a certain link of the economic cycle, the activity of many commercial agents, connected by several transactions, is threatened.

Key words: economic crisis, dynamic model, supply and demand.

JEL Classification: F21, G30, G33, M21, M48.

1. Introduction

Worldwide, Romania is not situated in the last group, but if we compare it with other European countries, we realize that along with Bulgaria, Romania places itself among the last. What is really important for Romanians is that the international financial institutions and the EU intend to support the economic recovery of Romania. The representatives of the World Bank, of the European Bank for Investments and of the International Monetary Fund came almost at the same time in Bucharest in order to support Romania. Due to the external support, the government succeeded in concluding an agreement with the IMF and the EU, in order to obtain funds to stop the fall of the Romanian economy. The agreement was concluded for an amount of 12.95 billion Euros with the IMF for two years' period. The total package of external financing with the fund, the EU, the World Bank and the European Bank for Reconstruction and Development (BERD) reaches a total of to 19.95 billion Euros.

2. The consequences of the worldwide economic crisis

By the end of 2009, Romania had already got loans of almost 11.5 billion Euros. But these loans only cover the "existing holes". Unfortunately, when the first withdrawals were made provisions for reducing the costs were not taken and, consequently, the first part of the money could not be used for starting programs which could have led to a real recovery of the economy.

According to the latest data published by the National Institute of Statistics, Romania's economy has decreased by 7.1% in 2009, after a decrease by 6.5% in the last quarter of 2009, comparative with the same period of 2008. Everybody hopes that starting with 2010, things will change and new funds for investments will appear and with them, new jobs. Moreover, the representatives of the international financial institutions assure that they will continue supporting Romania to increase its capacity of accessing the structural funds.

3. The economic crisis and its influence in Europe

New funds will be available for the necessary co-financing in order to use the European funds from 2007 until 2013. The international financial support is necessary since Romania must obtain the European funds in the conditions imposed by the EU, conditions in accordance with the existing regulations in the developed countries of the EU. We should not forget and it should have been taken into consideration when negotiations were held that the EU is actually a form of association of developed countries. Unfortunately, Romania is a relatively poor country with a limited administration capacity which tries hard to comply with these regulations for the developed countries and it does not

always succeed. Neither the EU, nor Romania is to be blamed for this situation. It is actually a discrepancy between what is expected of a state-member and what Romania can really accomplish.

The structural funds are very necessary in the logistics and the infrastructure of the transportation. A study of the World Bank shows that an advanced logistics field can increase the GDP of a country by 1% and the volume of international trade by 2%. So far, although Romania has benefitted from European funds for building highways, it has failed.

Unlike Romania, Croatia – a smaller country which is not an EU member yet – has already got an incredible road transportation network. The Croatian government has had a better management of the funds and of the projects. The improvement of the road infrastructure will increase the chances for more foreign economic agents to come in Romania and for the Romanian market to become more interesting and attractive. The economic forecast of the IMF for Romania anticipates a 4.6% decrease of the GDP for this year. The forecast has been accepted by our government in discussing the budget for 2009 and this led to a cutting of the sums earmarked for all the ministries, except those for the Ministry of Labour and Social Protection. Nine out of ten entrepreneurs were struck by the economic crisis while 55% of managers and professionals were affected. “The percentage will seriously increase among the employees working in the higher education system and not only there, but due to the cutting down of salaries in the budgeting system”, stated by M. Chivu, executive at Mercury Research.

Even those who for the time being do not have a job were strongly affected: 95% of them have felt the impact. On the other hand, 66% of Romanians are more worried by their financial situation than they were six months ago, the percentage still being lower than the one in March 2009 (75%), but higher than that in November 2008, when the first signs of the economic crisis appeared in Romania and when only 53% expressed their fear. The main worries they have had concern with the impossibility of maintaining the same living standard as in the present (40%), with the decrease of their incomes (39%) or by the uncertainty of coping with the current expenses (38%).

The worries concerning the impossibility to pay the installments are also valid for 15% of Romanians over 18 and 14% are afraid that they will not be able to save or invest as they did in the previous years. As for the evolution of the financial stability of the banks in the next semester, the percentage of those who consider that the situation will be worse has decreased compared with that of the last year, from 61% to 40%. More than a quarter of respondents estimate that the financial stability of the banks will be the same next semester and 13% consider that it will even increase. These data are part of The Financial Crisis Meter Survey made by Mercury Research, beginning with the 15th of March and the 1st of April 2010, on a sample of 1.177 of age respondents.

Romania's GDP recorded a major correction of 7.2% in 2009, after the record level of 126.4 billion Euros in the previous year, by 7.1% over the figures recorded in 2007. That was the first annual decrease since 1999. The nominal GDP had increased three times since 1999.

The National Institute of Statistics announced that Romania recorded an inflation rate of 0.56% in September as compared with the same period of the previous year or the background of high prices for goods and services. In January, the direct foreign investments in Romania amounted to 302 million Euros, i.e. a decrease by 67% as compared to January 2009. Last year, the direct foreign investments amounted to 4.9 billion Euros after they had reached the highest level the past December period, i.e. over 9 billion Euros. The long and middle term external debt of Romania “burst” in 2009, increasing by over 14 billion Euros on the whole year, up to 64.2 billion Euros at the end of the year. In January, the long and middle term external debt remained at the same level as in December, while the short term debt decreased by 5.5% up to 13.65 billion Euros.

The increase of the public debt appeared in the background of the decrease of the incomes in the state budget, which forced the government to borrow heavily in order to comply with its obligations.

The increase of the prices for consumption surpassed the analysts' forecast, i.e. an annual inflation of 7.6%. The unemployment recorded again an increasing trend beginning with the second half of 2008, and lately the rate of unemployment has increased by 0.2 – 0.3% every month. In February, the unemployment rate reached 8.3% as compared with 8.1% in January and 7.8% at the end of the last year. The exports have grown with 19.8% (Euros) in January as compared with the same month in 2009, up to 2.3 billion Euros, thus continuing the upward trend started in last November.

In the first three quarters of 2010, as compared to the corresponding period of the previous year, the gross index of the industrial production was greater with 5.2%, a growth increase determined by

two out of three industrial sectors: the supply of electricity, heat, gas, hot water and air conditioning production and supply (+9.4%) and the processing industry (+5.5%), aspects presented in Figure1.

Thus, in the mining industry, the output decreased by 7.7%, and in the manufacturing industry, the most important increases were recorded in the following branches: the automobiles, trailer and semi-trailer manufacture, electric equipment manufacturer (+33.4% each) and the metallurgical industry (+33.2%). Significant decreases of the production in the processing industry were recorded in other means of transportation manufacture (-34.6%), cigarette manufacture (-22.7%) and in the other industrial activities (-16.6%). On the large industrial groups, increases of the output have been obtained in: intermediary goods industry (+9.9%), capital goods industry (+9.0%) and energy industry (+3.9%). In the household goods industry and in the durable goods industry, the production decreased by 4.4%, respectively by 1.9%.

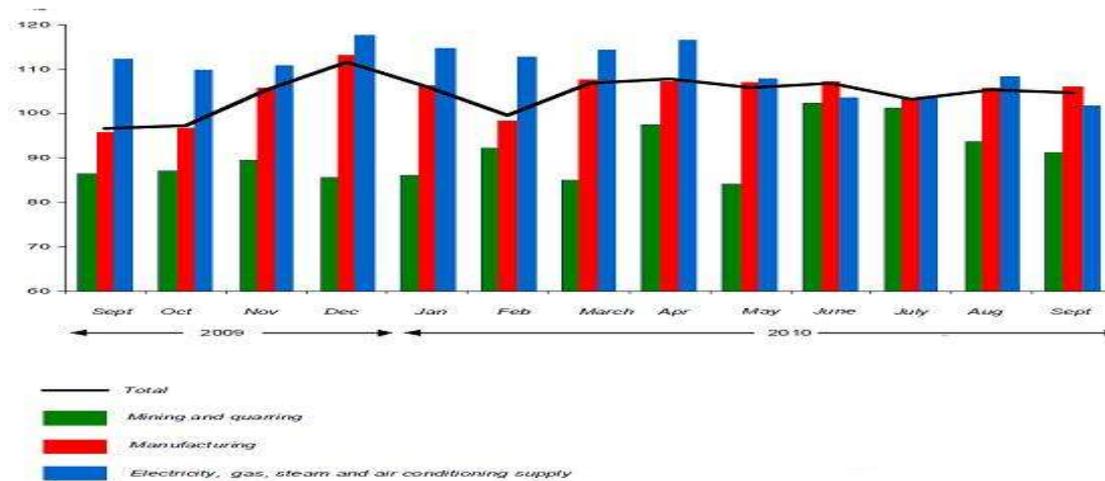


Figure 1. Industrial volume index of output from September 2009 until September 2010 - gross series -

The turnover of retail trade firms decreased in January, as an adjusted series, depending on the number of black-letter days and season, by 10.3%, as compared to January 2009.

The decrease of retail returned to two figures level after the last months of the previous year when the rhythm of adjustment of the trade turnover had started to flatten.

The following indices of turnover in the industry were reached in September 2010 as compared with the corresponding period of the previous year: the total value index of the turnover in the industry (domestic and external market) rose to 10.8%, due to the manufacturing industry (+11.7%) and in the mining industry turnover has decreased by 7.3% (Figure 2).

Thus in the manufacturing industry, the most significant increases of the total turnover were in the following branches: metallurgical industry (+45.9%), computers, electronic components and optic products manufacture (+36.7%), automobile, trailers and semi-trailers manufacture (+30.1%), coking products manufacture and refined petroleum products manufacture (+24.9%).

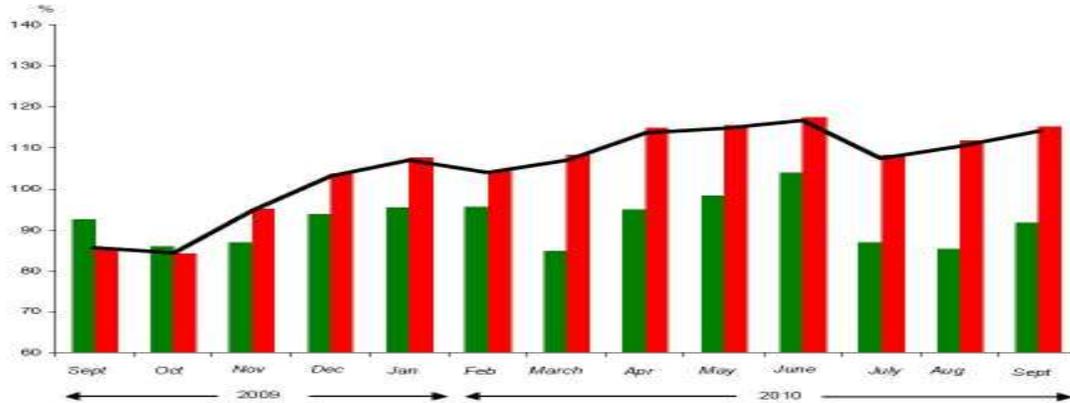


Figure 2. The value index of the industrial turnover between September 2009 and September 2010

We can also mention important decreases of the total turnover for the industrial branches: other means of transportation manufacture (-19.7%), the repair, maintenance and installation of the machines and equipment (-19.2%), the manufacturing of tobacco-based products (-14.3%), other industrial related activities (-7.5%) and alcohol production (-6.3%). On the large industrial groups, we note the increase of the total turnover in the following branches: the capital goods industry (+17.6%), followed by the energy industry (+16.3%), intermediary goods industry (+13.8%) and durable goods industry (+5.3%). In the household goods industry, the turnover decreased by 0.1%.

In December, the volume of construction works diminished, as an adjusted series, by 13.1% depending on the black-litter days and the season, as compared to the recorded level in the same period of the last year. The construction field has been one of the most affected by the present economic crisis. The labour market has also changed. The number of employees in industry (in the economic agents with more than four employees) was 1,213,600 in September 2010, by 0.200 more than in August 2010. The most of them, 980,900 are employed in the manufacturing industry, followed by water supply sanitation, waste management, remediation activities, 95,900 employees, the production and supply of electricity, heat, gas, hot water and air conditioning with 72,500 persons and by the mining industry with 64,300 employees. In the industrial branches, the food industry plans on the first place with 144,900 persons followed by clothing manufacture with 142,000 and automobiles, road vehicles, trailers and semi-trailers with 118,000 employees.

The average gross salary in industry was 1953 lei in September 2010 and the net one – 1419 lei, i.e. an increase as compared to August 2010 (+1.1%) – see Figure 3 and also as compared to September 2009 (+6.6%).

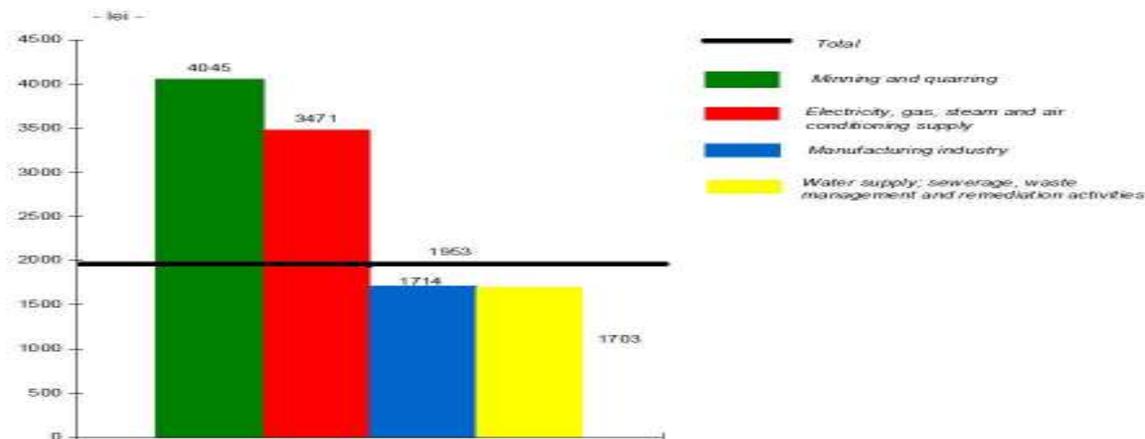


Figure 3. The average gross salary in the industry sector in September 2010

The highest average gross salary has been recorded in the electricity, gas, heat and air conditioning production and supply industry – 3,471 lei, followed by 4,045 lei in the mining industry and by the processing industry with 1,714 lei. The lowest salary had been recorded in the following branches: clothing manufacture – 1,134 lei, woodworking, manufacture of wood and cork products, except for the furniture; straw products manufacture and other industrial plants manufacture – 1,156 lei and leather manufacture, leather tanning voyage products and morocco leather goods manufacture, harness, footwear manufacture, dyed furs manufacture – 1,218 lei. The lowest average gross salary of 1,705 lei was in the sector of water supply, sanitation, and waste management and remediation activities.

The lei-euro currency rates of exchange have settled between 4.2 – 4.3 lei in the last months of the previous year. In the last part of the year and in the first months of 2009, the value of the euro increased rapidly, exceeding the rate of 4 lei/euro.

At the beginning of 2010, our currency became stronger and the rate fluctuated between 4.1 – 4.15 lei/euro, compared to an average of 4.22 lei in the year before. The US dollar has had an increasing trend lately, reaching up to 3 lei.

There could be solutions for all these deficits but in order to apply them, Romania needs time. The lack of anti-crisis measures leads to a deepening of the situation. Thus, applying financial taxes at the level of the European and global nations would further contribute to solve other problems (cooperation for development, the fight against weather changes) and would help the economy worldwide recover.

The proposal concerns two type of taxes: the first one applied to the financial activities, on the whole European sector and the second one applied to international financial transactions. Since the banks and other companies which supply financial services have had an important role in the beginning of the crisis and since they have benefitted from a considerable support from the government of state-members these last two years, the tax would act as a contribution of the financial system to the economic recovery.

On the other hand, compared to other sectors of the economy, the financial sector has fewer taxes to pay. For example, many banks are exempt from the value added tax and benefit from other various preferential advantages. The incomes thus obtained could be deposited as a fair contribution to the state budget.

Meanwhile, the introduction of an international tax on financial transactions would act as a means of generating new incomes. These could be used to finance global policies, for instance the aid for development and the fight against weather changes.

The European Commission will evaluate the impact of such a tax on the economy. If the effects of the crisis are not reduced in “the next period, the major risks for Romania consist in little deviations from the measures and goals stipulated in the agreement with the IMF, especially the admitted maximum budgetary deficit on 2010, i.e. 5.9% of GDP and respectively the goals established for each quarter”, stated by Baltavan. A new agreement with the IMF is “absolutely necessary” in order to facilitate Romania’s access on the European bonds market. “The money thus obtained will be used to cover the budgetary deficit and to pay the present loan from the fund”.

4. Conclusions

Some American economists, analysts and journalists have made a study referring to the different effects of the economic crisis on women and men. The results showed that women have coped better with the crisis’ effects.

The similar results were obtained in Europe, USA, Asia and South America and these led journalists to entitle the current crisis – “the mancession”. Many analysts reached the same conclusion and so the term “mancession” – used to define the phenomenon – has entered the common language.

Why are men more affected by the crisis? Statistics have shown that men are more affected than women. Romanian women have saved their families during the crisis. The EU’s statistics show that 75% of the jobs created since 2005 have been occupied by women, one of the reasons being that in 90% of cases, women are better paid.

Analysts consider that so far the agreement with the IMF has been the real anti-crisis measures taken by the government. As for the anti-crisis plan applied so far by them, this has been nothing, but a

political action strictly formal without positive effects on the economy. Up to now, the state's action has been inefficient since most of the measures could not be applied. The cutting down of the expenses? The public officers and other savings must be used for important investments, and not for other acquisitions.

The state's intervention in the economic recovery has been rather inefficient so far. The crisis started in the private sector and this brought ahead the great current account deficit. We cannot ask the state to restructure the private sector. Both in the private as well as in the public sector we can conclude that they both need an adjustment to decrease the effects triggered and that measures for their recovery are not yet possible.

The authorities' plan focused on the cutting down of the expenses and the structural reforms too have actually had monetary goals: to reduce the expenses for salaries and retirements. This plan can help to decrease the deficit and to finance it but it cannot be a support for the economic recovery. On the contrary, on the short term the cutting down of the expenses may deepen the crisis, that is why the most viable solution would be to apply taxes and the value added tax (VAT) on the incomes of the banks too.

References:

- [1] Bari, L., Șerbănescu, I. 1985. *Global economic crisis and the problems of youth*. Ed. Bucharest.
- [2] Covey, St. 2010. *Eficiența în șapte trepte*, Editura ALL, Bucharest, in Romanian.
- [3] Dijmărescu, E., Ghibuțiu, A., Isărescu, M., Murgescu, C., Nistorescu, N., Pop, N., Radu, V., Titircă, R. 1986. *Global economic crisis*, Scientific and Encyclopedic Publishing House, Bucharest.
- [4] Foster, J.B., Magdoff, F. 2009. *The Great Financial Crisis: Causes and Consequences*. Publisher: Monthly Review Press.
- [5] George, B. 2009. *Seven Lessons for Leading in Crisis*. Jossey-Bass, San Francisco.
- [6] Gust, M., Mihăilescu, M., Puiu, O. 2006. *Bodies and international economic policy*, Ed. Economic Independence, Pitesti.
- [7] Heifetz, R.A. 1994. *Leadership without Easy Answers*. Harvard Business School Press, Boston,
- [8] Hrebenciuc, A. 2010. *Iluzia. Erou și antierou în crizele economice*, Editura Corint, București, in Romania.
- [9] Marin, D. 1999. *I am Romanian - reform crisis?* Economic Publishing House, Bucharest.
- [10] Puiu, A. 1983. *Contradictory developments in the global economy*, Bucharest, Political Publishing House.
- [11] Shiller, R. 2008. *The subprime solution: How today's global financial crisis happened and what to do about it*, Princeton University Press, New Jersey,
- *** Leading through a Crisis (Skills You Need Today), Harvard Business School Press, 2009.
- *** Institutul Național de Statistică, Buletin Statistic de Industrie, nr. 9\2010.

A BEHAVIORAL EXPLANATION FOR THE ASYMMETRIC VOLATILITY EFFECT

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Abstract:

In this study, we test whether the behavioural bias labelled “disposition effect”, defined as the tendency of investors to ride losses and realize gains, leading to asymmetric return-volatility relation before and during subprime crisis periods. The study of the cross-sectional relation between past cumulative return, current return and volatility shows that volatility is less sensible to return shocks when cumulative past return is positive. Using the capital gain measure of Grinblatt, and Han (2005), we examine the relation between capital gain, current return and volatility for American stocks during tranquil and turmoil periods. We find that negative capital gain of disposition investors explain a large part of asymmetric volatility mainly in subprime crisis period. Moreover, volatility is less sensitive to return shocks under positive capital gain before subprime crisis. Although, during subprime crisis period positive capital gain increases volatility of bigger stocks. This finding can be explained by the loss aversion bias which leads investors to take their positions because of increasing of failure risk during global financial crisis period.

Keywords: asymmetric volatility; disposition effect; behavioural finance; subprime crisis, capital gain

JEL Classification: C32, F15

1. Introduction

It has been a challenge for financial economists to explain a stylized fact that volatility is negatively correlated with lagged returns, a phenomenon known as the asymmetric volatility effect. There is an ongoing debate concerning the appropriate interpretation of this phenomenon.

The two documented theories associated with this negative relation are the leverage effect hypothesis and the feedback hypothesis. The leverage effect hypothesis suggests that negative shocks to returns increase financial leverage, making stocks riskier and therefore subsequently driving up the volatility (Black 1976), and Christie 1982). The feedback hypothesis postulates that positive shocks to volatility cause negative returns (Pindyck 1984, and French *et al.* 1987), and Campbell, and Hentschel 1992). This hypothesis relies on the existence of time-varying risk premiums as the link between changes in volatility and returns (Poterba, and Summers 1986).

However, both of leverage effect and feedback hypotheses have been questioned. Papers studying the leverage hypothesis (Schwert 1989) have argued that it cannot fully account for the volatility response to stock price changes. The feedback hypothesis is controversial because it hinges upon a positive correlation between expected return and volatility (Avramov *et al.* 2006).

Recently, behavioral finance provides a convening explanation for the asymmetric volatility effect. This explanation may be derived from psychology of judgment and choice such as the impact of the loss aversion bias and the disposition effect. Disposition effect, first documented by Shefrin, and Statman (1985), suggests that investors tend to hold assets on which they have experienced paper losses, but they tend to sell assets on which they have experienced paper gains. Consequently, for loser stocks, investors subject to disposition effect hold their stocks, resulting in illiquidity for the stock, mainly for negative current returns. If demand shocks cause price changes as in Campbell *et al.* (1993), then these price changes will be more intense due to illiquidity. For winner stocks, disposition investors are willing to sell their shares, making the market more liquid for the stock. Then, volatility should increase less in the presence of demand shocks.

Fewer studies have been interested to the relation between conditional volatility and disposition effect (Cunha 2009, Hibbert *et al.* 2008). In this paper, we test whether the disposition effect leading to asymmetric volatility in the American stocks market during the period of January 1999 to August 2010.

Our sample period is characterized by the occurrence of the current global financial crisis following the advent of the subprime mortgage crisis in the United States. This crisis is considered as one of the most serious and dramatic international financial crises of recent decades. During this turmoil period all indices fall about 30-40% in the period of mid-September to the end of October 2008 (Batram, and Bodnar 2009). The current financial crisis affects considerably the market volatility which has been high during mid 2007-2009, particularly during the 2008 period.

Since the significantly effect of this crisis on volatility, this paper explores the contribution of disposition bias to explaining asymmetric volatility before and during global financial crisis. Disposition effect is estimated using the Grinblatt, and Han (2005) measure for capital gains (losses) based on past prices and stocks turnover.

Thus, this paper makes an original contribution in understanding the asymmetric volatility effect under global financial crisis and adds to the existing literature.

The rest of the paper is organized as follows. Section 2 presents the literature review of asymmetric volatility and disposition effect. Section 3 describes methodology and data. Section 4 reports the empirical results. Section 5 concludes the paper.

2. Literature review

Stock return volatility is central to asset pricing models, risk management, asset allocation, and market efficiency. Volatility clustering in financial data has been well studied and extensively modelled by the autoregressive conditional heteroskedasticity (ARCH) of Engle (1982), and the generalized ARCH extension of Bollerslev (1986).

Empirical evidence shows a greater asymmetric effect of return shocks on volatility. More specifically, when returns decline volatility increases. Bollerslev *et al.* (2006) examine the relationship between volatility and past and future returns using high-frequency aggregate equity index data. They find a negative correlation between stock market returns and stock market volatility over fine intraday sampling frequencies.

Several explanations of this asymmetric return- volatility relation are put forward. On the one hand, the leverage effect hypothesis, noted by Black (1976), and Christie (1982), suggests that a drop in the value of stocks increases its volatility. Schwert (1989) argues that operating leverage leads to the negative relation between returns and volatility to be more pronounced during recessions. Thus, both operating and financial leverages lead firms to appear riskier and have higher volatility when stock prices decline. Avramov *et al.* (2006) show that leverage has no impact on asymmetric volatility at the daily frequency. Bollerslev *et al.* (2006) conclude that the magnitude of the negative return-volatility relation is too large to be explained by financial leverage fluctuations.

On the other hand, numerous studies suggest that the asymmetric response of volatility to return shocks could simply reflect the presence of time varying risk premium (French *et al.* (1987) Campbell, and Hentschel (1992) develop a theoretical model suggesting that if expected future stock returns increase when volatility increases, then current stock prices (and hence returns) will fall to adjust to this change in future expectations. Thus, an increase to volatility causes negative returns. Boujelbène *et al.* (2009) investigate the relation between excessive trading volume of overconfidence investors and excessive prices volatility. They show that the excessive trading of overconfident investors makes a contribution to the observed excessive volatility.

Overall, the advanced explanations ignore the behavioral elements of asymmetric volatility effect.

Since the prospect theory by Kahneman, and Tversky (1979), there has been a growing literature on how behavioural biases such as loss aversion and disposition effect can influence the rationality of financial decision makers. Grinblatt, and Han (2005) consider that disposition effect is the plausible explanation of a puzzling finding of return predictability in the intermediate horizon, called momentum effect. Also, Frazzini (2006) find empirical evidence that the disposition effect should cause under reaction to information and so momentum in stock returns.

Low (2004) proposes that behavioural bias could lead to the asymmetric effect of losses being related with larger volatility innovations than are gains, but he does not examine empirically behavioural explanation and he only investigates the leverage hypothesis to test the overall relation.

Avramov *et al.* (2006) provide empirical evidence that the combination of signs of current return and cumulative past returns over a few days plays a role in conditional volatility. This article

finds that selling activity governs the asymmetric volatility phenomenon in individual stock returns. Focusing on asymmetric volatility of sell trades, the authors suggest that the disposition effect leads to more (less) selling by uninformed investors after positive (negative) past returns and that the informed (uninformed) traders generally reduce (increase) volatility.

3. Empirical methodology and data

3.1. Methodology

The first stage of our analysis is to investigate the monthly return-volatility relation. Specifically, we evaluate asymmetric volatility effect by estimating the parameters of the following regression:

$$\sigma_{j,t+1}^p = \alpha + (\beta_0 + \beta_1 I_{j,t}) \cdot |\varepsilon_{j,t}| + \theta_1 \sigma_{j,t}^p + v_{j,t} \quad (1)$$

Where, j is the stocks, t is the months, $\varepsilon_{j,t}$ is the unexpected return, $\sigma_{j,t}^p$ is the conditional volatility, $v_{j,t}$ is an error term, $I_{j,t}$ is a dummy variable, that equals 1 if the unexpected return, $\varepsilon_{j,t}$, is negative, and equals zero otherwise, α is a constant and β_0 , β_1 , and θ_1 are parameters to be estimate.

This specification is referred to as threshold-GARCH, or TARARCH model taking into account an asymmetric effect in which a negative return shock increases volatility more than does a positive return shock. The asymmetric effect in this specification is represented by the volatility parameter β_1 . If $\beta_1 < 0$ then a negative shock has an impact on conditional volatility superior than does a positive shock.

In the second stage, we test the hypothesis suggesting that the combination of signs of current return and cumulative past returns can explain conditional volatility. We estimate the following regression (Cunha 2009).

$$\sigma_{j,t+1}^p = \alpha + (\beta_0 + \beta_1 I_{j,t}^{ss} + \beta_2 I_{j,t}^{pn} + \beta_3 I_{j,t}^{pp}) \cdot |\varepsilon_{j,t}| + \theta_1 RV_{j,t}^6 + \theta_2 RV_{j,t}^{12} + v_{j,t} \quad (2)$$

where $I_{j,t}^{ss}$ are dummy variables defined as follows: $I_{j,t}^{ss}=1$ if past cumulative return and current return are negative, $I_{j,t}^{pn}=1$ if past cumulative return is positive and current return is negative, $I_{j,t}^{pp}=1$ if past cumulative return and current return are positive. Past cumulative return is calculated for the three previous months. $RV_{j,t}^m$ is the realized volatility of the m months starting at $t - m + 1$.

In the third stage, we test whether the behavior of disposition investors leads to asymmetric volatility by considering the following analysis.

In the presence of investors subject to disposition effect, market is very liquid for winner stocks because disposition investors are inclined to sell their shares. Positive demand shocks (demand shocks that cause price increase) are easily absorbed at small price changes. But, if disposition investors are losing on a stock, they do not want to either sell or buy shares of that stock; they just want to hold their current position. The market is then more illiquid for a past loser, and conditional volatility should react more to demand shocks.

Because disposition investors are averse to losses, they want to sell a share if its current price is above the price they paid for it, and hold it if the current price is below. The difference between current and paid prices is the capital gain. The cumulative past return over the three preceding months used in Eq.2, is a rough proxy of capital gain considered as a critical variable for disposition investors. So, we repeat the regression model in Eq.2 by replacing cumulative past return by capital gain measure.

$$\sigma_{j,t+1}^p = \alpha + (\beta_0 + \beta_1 g_{j,t}^{ss} + \beta_2 g_{j,t}^{pn} + \beta_3 g_{j,t}^{pp}) \cdot |\varepsilon_{j,t}| + \theta_1 RV_{j,t}^6 + \theta_2 RV_{j,t}^{12} + v_{j,t} \quad (3)$$

where $g_{j,t}^{ss}$ are dummy variables defined as follows: $g_{j,t}^{ss}=1$ if capital gain and current return are negative, $g_{j,t}^{pn}=1$ if capital gain is positive and current return is negative and $g_{j,t}^{pp}=1$ if capital gain and current return are positive.

Capital gain measure is central to the empirical analysis in this paper since it permits one to compute the dollar's gains and losses experienced by the stock holders on a given date. The capital gain is defined as the percentage deviation of the aggregate cost basis from the current price (Grinblatt, and Han 2005).

$$g_{j,t} = \frac{P_{j,t} - R_{j,t}}{P_{j,t}} \quad (4)$$

Where $P_{j,t}$ is the current price, $R_{j,t}$ is the reference price.

Following Grinblatt, and Han (2005), we compute the reference price R_t (proxy for the market's cost basis in a stock) for each stock at the end of every month between January 1999 and August 2010 using previous 12 months data. Our estimate of reference price is as follows:

$$R_{j,t} = \sum_{n=1}^n \left(V_{j,t-n} \prod_{\tau=1}^{n-1} [1 - V_{j,t-n+\tau}] \right) P_{j,t-n} \quad (5)$$

Where $V_{j,t}$ is date t 's turnover in the stock. The term in the parentheses multiplying $P_{j,t-n}$ is weights, and k is a constant that makes the entire weights sum to one. The weight on $P_{j,t-n}$ reflects the probability that the shares purchased on date t have not been traded since. 12 months are considered to compute the sum.

The regressions described above (Eq.1, Eq.2 and Eq.3) are estimated for three equal sized groups (small, medium and big). The proxy for size was market capitalization computed as the product of share price by the number of shares outstanding. This classification allows controlling size effect referring to the negative relation between security returns and the market value of the common equity of a firm (Banz 1981).

3.2. Data

This paper uses monthly data on price level, transaction volume and number of share outstanding of 90 stocks listed on the S&P 500 index. Based on the Global Industry Classification Standard (GICS), we consider companies of industrial and material sectors. The sample period covers January 1999 through August 2010. All data are taken from DataStream. We use monthly data to construct variables of our empirical framework. Notably, return, turnover ratio, market capitalization and capital gain. Stock return is calculated taking into account the dividends. The turnover is defined as the ratio of the number of shares traded in a month to the number of shares outstanding. Market capitalization is computed as the product of share price by the number of shares outstanding. The critical variable, capital gain is calculated according to Eq. 4.

4. Results

4.1. Summary statistics

Since our sample period (January 1999 -August 2010) includes the global financial crisis of 2008-9, we perform our empirical analysis for two sub-periods. The first is relative to sample period preceding subprime crisis called tranquil period (January 1999- June 2007) and the second is relative to the crisis or turmoil period (July 2007- August 2010). The choice of the later period is based on the results of Chow breakpoints test which suggests that the subprime crisis was started in July 2007 (F-statistic= 514.525, probability = 0.000). Thus, it is interesting to investigate the behavior of return, capital gain and volatility variables in tranquil and turmoil periods.

Table 1 provides summary statistics of the return, capital gain and volatility in tranquil period (Panel A) and turmoil period (Panel B). The table reports the equally weighted mean, median, maximum, minimum, standard deviation, skewness, Kurtosis and Jarque-Bera statistic.

The results presented in this table show that the mean return is positive before subprime crisis and it is negative during crisis period. The most important, is that returns achieves their maximum (0.146) and their minimum (-0.176) during turmoil period which indicates that volatility is higher during subprime crisis period. This result is confirmed by descriptive statistics of volatility. Thus, volatility reaches his maximum (0.034) in the turmoil period. Moreover, the skewness coefficient of the volatility distribution is different from zero which reflects the character asymmetric of volatility.

The mean of capital gain distribution is negative before and during global financial crisis. Consequently, proportion of capital loss exceeds proportion of capital gain. The excessive capital loss could explain the asymmetric return- volatility relation. Indeed, loss aversion bias leads disposition investors to hold their position in loser stocks and causes market illiquidity. In this case, demand shocks are not easily absorbed generating an excessive volatility.

Table 1. Return, capital gain and volatility, summary statistics

Panel 1: Tranquil period			
	<i>Return</i>	<i>Capital gain</i>	<i>Volatility</i>
<i>Mean</i>	0.0053	-0.0413	0.0122
<i>Median</i>	0.0077	-0.0217	0.0116
<i>Maximum</i>	0.0915	0.1338	0.0225
<i>Minimum</i>	-0.0993	-0.2955	0.0059
<i>Std. Dev.</i>	0.0381	0.0906	0.0052
<i>Skewness</i>	-0.0947	-0.3838	0.4188
<i>Kurtosis</i>	3.3121	2.5309	1.7502
<i>Jarque-Bera</i>	0.5609	3.4053	9.5265
Panel 2: Turmoil period			
	<i>Return</i>	<i>Capital gain</i>	<i>Volatility</i>
<i>Mean</i>	-0.0030	-0.0819	0.0132
<i>Median</i>	0.0019	-0.0467	0.0104
<i>Maximum</i>	0.1465	0.1597	0.0346
<i>Minimum</i>	-0.1762	-0.7089	0.0066
<i>Std. Dev.</i>	0.0641	0.2041	0.0066
<i>Skewness</i>	-0.2528	-1.2679	1.3727
<i>Kurtosis</i>	3.3207	4.2213	4.4629
<i>Jarque-Bera</i>	0.5675	12.5440	15.3219

Source: (own)

Figure 1 presents the monthly time series of the average of return, capital gain and volatility in tranquil period (Fig 1-a) and turmoil period (Fig 1-b). From January 1999 to December 2002, figure (1-a) indicates that higher frequency of return and capital gain is negative and volatility is so bigger. This finding can be caused by the persistent of 2000 technological crisis (Bensafta, and Smedo 2005) and the impact of September 11 attacks on the stock markets (Nikkinen 2008). From January 2003 to Jun 2007, figure shows harmonized movements of the stock return, capital gain and volatility, till end Jun 2007. From July 2007 to mid- July 2009, figure (1-b) shows that the return of American stocks has a significantly sharp decrease because of a loss of confidence by investors in the value of securitized mortgages in the United States. A return decreasing at the same time as an increasing of volatility typifies the SP500 index. In this turmoil period, capital gain decreases and reaches a minimum value (0.708).

An improvement of the financial situation characterizes the period of July 2009 to August 2010 because of the corrective measures taken by American governments and financial authorities.

Fig.1-a. Tranquil period

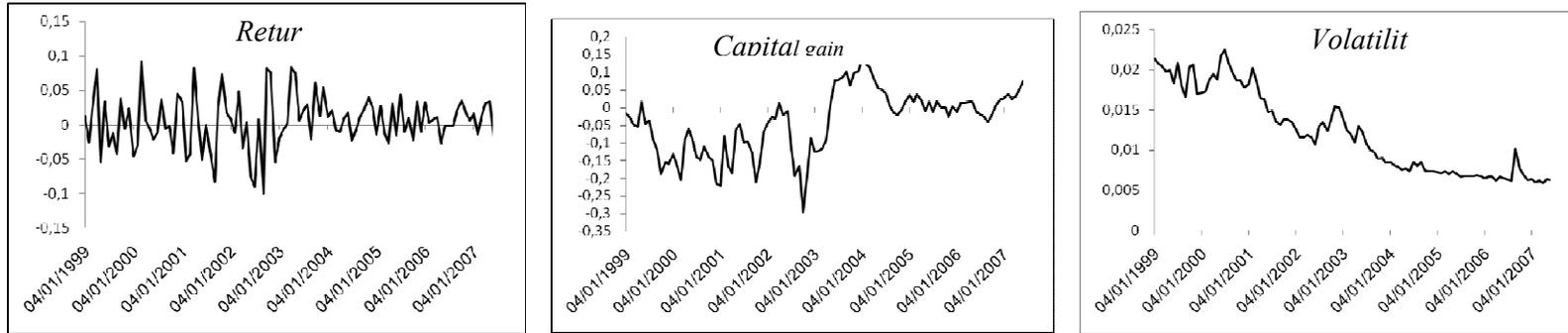


Fig.1-b. Turmoil period

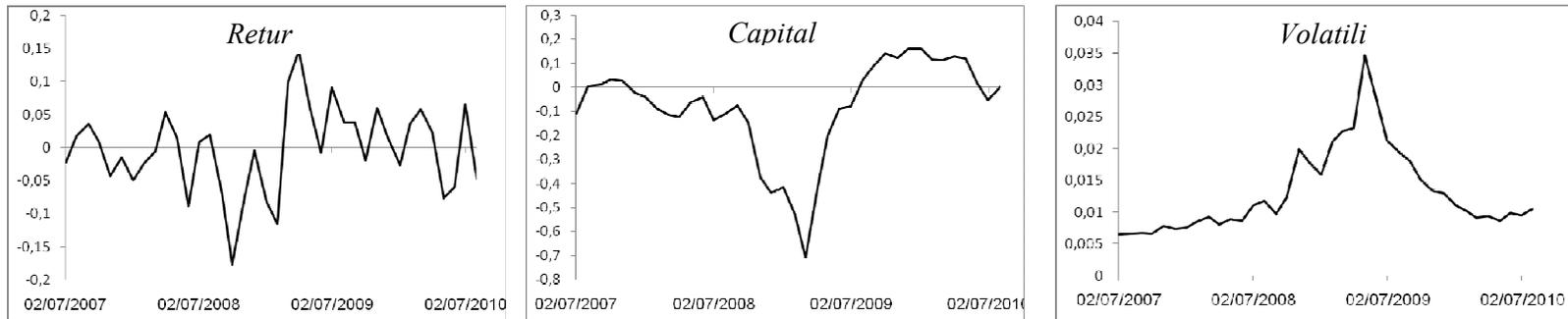


Figure 1. Monthly moving of return, capital gain and volatility

Source: (own)

4.2. Asymmetric return-volatility relation

This subsection examines empirically the asymmetric volatility effect on SP500 stocks. Table 2 presents results of estimation Eq. 1 for three sized groups in tranquil (Panel A) and turmoil (Panel B) periods, *t*-statistics reported in the parentheses are adjusted for the heteroscedasticity using Newey, and West correction.

Table 2. Asymmetric return-volatility relation

Panel A: Tranquil period			
	Small	Medium	Big
α	-0.0007*** (-5.6830) 0.0001	0.0003*** (2.7609) 0.0001	5.85E-05 (0.5287) 0.0001
β_0	0.0506*** (33.0346) 0.0015	0.0357*** (19.2528) 0.0018	0.0259*** (19.9659) 0.0013
β_1	-0.0048*** (-2.8676) 0.0017	-0.0033* (-1.7007) 0.0019	-0.0049*** (-3.5412) 0.0014
θ_1	0.7682*** (112.2241) 0.0068	0.7432*** (88.1984) 0.0084	0.8354*** (135.510) 0.0062
R^2 adjusted	0.86364	0.79587	0.87965
<i>F</i> value	6457.415	3976.620	7454.189
<i>Obs. number</i>	3060	3060	3060
Panel B: Turmoil period			
	Small	Medium	Big
α	-0.0019*** (-4.8648) 0.0004	0.0022*** (4.3718) 0.0005	-0.0004 (-1.2956) 0.0003
β_0	0.0804*** (18.0531) 0.0044	0.0605*** (9.0088) 0.0067	0.0223*** (4.8907) 0.0045
β_1	-0.0080* (-1.7670) 0.0045	-0.0124* (-1.8147) 0.0068	0.0016 (0.3518) 0.0046
θ_1	0.6615*** (43.8291) 0.0151	0.4702*** (28.939) 0.0162	0.9049*** (56.1502) 0.0161
R^2 adjusted	0.8102	0.6028	0.8172
<i>F</i> value	1152.609	410.2891	1207.044
<i>Obs. number</i>	810	810	810

Note: ***, **, * denote significant at the 1%, 5% and 10% levels, respectively.

Source: (own)

We show that β_0 is significant for all size groups. Thus, conditional volatility responds substantially to innovations shocks. A positive and significant θ_1 indicates that the volatility has a long memory.

Results show that β_1 is statically significant before and during subprime crisis periods for all size groups except for bigger stocks during turmoil period. Thus, the volatility increases following a previous drop in stock returns. This finding supports the presence of asymmetric volatility effect in our sample stocks.

4.3. Asymmetric volatility and cumulative past returns

Table 3 reports the estimated parameters of the relation between past cumulative returns, current return and asymmetric volatility (Eq. 2) in the tranquil (Panel A) and turmoil period (Panel B); *t*-statistics are reported in the parentheses. The parameter β_1 is significantly positive only for the medium stocks before subprime crisis and for small stocks during crisis period. Therefore, we cannot affirm that negative cumulative past return associated with negative current return increase volatility of all size groups.

The parameter β_2 is statistically significant only for bigger stocks before subprime crisis. Consequently, there is no consensus about the impact of the combination of positive cumulative past return and current negative return on volatility.

The parameter β_3 measuring the effect of cumulative positive past returns and positive current return on volatility is negatively significant for the majority of size groups before and during subprime crisis period. This result indicates that volatility is less sensible to return chocks when cumulative past return is positive.

The small significance of β_1 and β_2 parameters, motivated us to finding explanation in the behavioral finance. Specifically, we investigate the contribution of the disposition effect bias to explain asymmetric volatility before and during global financial crisis period.

Table 3- Asymmetric volatility, cumulative past return and current return

	<i>Panel A: Tranquil period</i>			<i>Panel B: Turmoil period</i>		
	Small	Medium	Big	Small	Medium	Big
α	-0.0050*** (-16.4235) 0.0003	-0.0035*** (-12.3556) 0.0003	-0.0031*** (-10.0179) 0.0003	-0.0075*** (-9.7598) 0.0007	-0.0065*** (-10.0313) 0.0006	-0.0078*** (-10.9117) 0.0007
β_0	0.0332*** (12.6697) 0.0026	0.0281*** (11.6385) 0.0024	0.0176*** (6.0284) 0.0029	0.0641*** (11.6030) 0.0055	0.0313*** (5.5670) 0.0056	-0.0290* (-1.7078) 0.0170
β_1	0.0044 (0.7192) 0.0062	0.0214*** (3.4249) 0.0062	0.0011 (0.1455) 0.0082	0.0386** (2.5583) 0.0151	0.0189 (1.3429) 0.0140	0.0213 (1.3191) 0.0161
β_2	0.0018 (0.2016) 0.0091	-0.0027 (-0.2731) 0.01003	0.0198* (1.9195) 0.01036	-0.0342* (-1.6733) 0.0205	-0.0303 (-1.3034) 0.0233	-0.0174 (-0.7257) 0.0240
β_3	-0.0023 (-0.3747) 0.0062	-0.0120* (-1.9015) 0.0063	-0.0139* (-1.7042) 0.0081	-0.0384** (-2.5090) 0.0153	-0.0390*** (-2.7099) 0.0144	0.0135 (0.8286) 0.0163
θ_1	0.0910*** (18.3738) 0.0049	0.0661*** (15.3572) 0.0043	0.0673*** (14.2970) 0.0047	0.0944*** (7.7687) 0.0121	0.1070*** (9.5418) 0.0112	0.1810*** (13.5382) 0.0134
θ_2	0.0676*** (13.0859) 0.0051	0.0646*** (14.1808) 0.0045	0.0770*** (15.3307) 0.0050	0.0533*** (3.9466) 0.0135	0.0723*** (5.6119) 0.0129	0.0448*** (3.0619) 0.0146
R^2 adjusted	0.6265	0.5721	0.4879	0.6149	0.6427	0.5803
<i>F</i> value	856.0966	682.9195	486.8950	213.7846	240.8005	185.0563
<i>Obs.</i> <i>number</i>	3060	3060	3060	810	810	810

Note: ***, **, * denote significant at the 1%, 5% and 10% levels, respectively.

Source: (own)

4.4. Asymmetric volatility and capital gain

Table 4 presents the estimated parameters of the Eq. 3 when dummies $I_{j,t}^{ss}$ are determined based on the sign of the capital gain, $g_{j,t}^{ss}$, instead of the cumulative past return over the past three months.

Panel A concerns tranquil period and panel B is relative to turmoil period; *t*-statistics are reported in the parentheses.

Results show that the parameter β_1 is significantly positive for all size groups. Thus, conditional volatility is more sensitive to shocks when capital gain and current return are negative. This finding suggests that capital loss of disposition investors explains a large part of asymmetric volatility mainly in crisis period. If disposition investors are losing on a stock, they want to hold their current position. Indeed, loss aversion bias leads them to not either sell or buy shares of that stock. The market is then more illiquid for past losers, and any demand shocks increase more conditional volatility.

Table 4. Asymmetric volatility and capital gain

	<i>Panel A: Tranquil period</i>			<i>Panel B: Turmoil period</i>		
	Small	Medium	Big	Small	Medium	Big
α	-0.0050*** (-16.360) 0.0003	-0.0035*** (-12.3919) 0.0002	-0.0032*** (-10.1370) 0.0003	-0.0069*** (-9.1156) 0.0008	-0.0063*** (-9.7540) 0.0006	-0.0084*** (-11.5826) 0.0007
β_0	0.0322*** (9.7506) 0.0033	0.0497*** (14.1608) 0.0035	0.0099*** (2.9287) 0.0034	0.0227 (1.4789) 0.0153	0.0124* (1.7030) 0.0073	-0.0237*** (-2.9343) 0.0081
β_1	0.0128*** (3.2695) 0.0039	0.0118*** (2.9897) 0.0040	0.0156*** (3.4847) 0.0045	0.0231*** (3.2971) 0.0070	0.0222*** (2.9980) 0.0074	0.0143* (1.7256) 0.0083
β_2	0.0077* (1.8609) 0.0041	-0.0090** (-2.2979) 0.0039	-0.0095** (-2.5372) 0.0038	0.0363*** (2.6265) 0.0138	-0.0008 (-0.0749) 0.0109	0.0235** (2.2243) 0.0106
β_3	-0.0083** (-2.2077) 0.0038	-0.0230*** (-5.3063) 0.0043	0.0034 (0.8527) 0.0040	-0.0485*** (-5.1063) 0.0095	0.0173 (1.2977) 0.0133	0.0453*** (3.5386) 0.0128
θ_1	0.0925*** (18.7215) 0.0049	0.0697*** (16.3509) 0.0042	0.0704*** (15.0408) 0.0047	0.0954*** (7.9597) 0.0119	0.1149*** (9.9356) 0.0116	0.1876*** (14.0084) 0.0134
θ_2	0.0659*** (12.8326) 0.0051	0.0630** (13.8694) 0.0045	0.0752*** (14.9112) 0.0050	0.0500*** (3.7577) 0.0133	0.0631*** (4.8075) 0.0131	0.0387*** (2.6550) 0.0146
R^2 adjusted	0.6265	0.5721	0.4879	0.6149	0.6427	0.5803
F value	856.0966	682.9195	486.8950	213.7846	240.8005	185.0563
Obs. number	3060	3060	3060	810	810	810

Note: ***, **, * denote significant at the 1%, 5% and 10% levels, respectively.

Source: (own)

Before subprime crisis β_2 is to significantly negative for medium and bigger groups. However this parameter is significantly positive for smaller and bigger groups during turmoil period. Indeed, in subprime crisis period, the behavior of disposition investors is more influenced by current negative return in financial market than by positive capital gain.

The parameter β_3 which captures the impact of positive capital gain and current positive return on asymmetric volatility is negative before subprime crisis. This finding can be explained by the fact that behavior of disposition investors is not symmetric for winner stocks and loser stocks. Indeed, disposition investors are inclined to sell winner shares (with positive capital gain) causing increasing of market liquidity. In this case, positive demand shocks (demand shocks that cause price increase) are easily absorbed at small price changes.

During turmoil period, β_3 is negative for smaller stocks but it is significantly positive for bigger stocks. Despite that bigger firms have positive capital gain and positive current return, loss

aversion bias leads investors to take their position because of increasing of risk failure during global financial crisis period.

5. Conclusion

The finance literature has continued to struggle to understand the asymmetric volatility effect. The aim of this paper is to examine asymmetric volatility effect in the behavioral perspective under financial crisis period. Specifically, we test whether the disposition effect, one of the most regularly behavioral biases, can explain the negative relation between volatility and lagged returns before and during subprime crisis periods.

The study of the return-volatility relation on SP500 stocks shows that the volatility increases more following a previous drop in stock returns also before and during subprime crisis period. This finding suggests the presence of asymmetric volatility effect.

The study of the relation between past cumulative return, current return and volatility indicates that volatility is less sensible to return shocks when cumulative past return is positive. The combination of negative cumulative past return and negative current return influences negatively and significantly only the volatility of medium stocks in tranquil period and smaller stocks during turmoil period.

These results motivated us to finding explanation in the behavioural finance. Using a capital gain measure of Grinblatt, and Han (2005), we estimate the contribution of disposition effect associated with current return to explain asymmetric volatility before and during subprime crisis periods. Results show that capital loss of disposition investors explains a large part of asymmetric volatility mainly under subprime crisis period. Indeed, market is more illiquid for a past loser stocks because disposition investors do not want to either sell or buy these stocks; they just want to hold their current position. Thus, any demand shock increases more conditional volatility.

Moreover, we find that volatility increases less in the presence of positive capital gain and positive current return in tranquil period for all size groups.

Although, during turmoil period, positive relation between volatility, capital gain and positive current return is noted for bigger stocks. This finding can be caused by the cognitive loss aversion bias which leads investors to take their position because of increasing of risk failure during global financial crisis period. This behavior of disposition investors contributes to markets illiquidity and augments conditional volatility.

Overall, our results provide extensive evidence on the contribution of disposition effect to explain asymmetric return-volatility relation.

References

- [1] Avramov, D., Chordia, T., Goyal, A. 2006. The Impact of Trades on Daily Volatility. *Review of Financial Studies*, Vol. 19, No. 4, pp. 1241-1277.
- [2] Banz, R. 1981. The Relationship between Return and Market Value of Common Stock. *Journal of Financial Economics*, Vol. 9, pp. 3-18.
- [3] Batram, S.M., Bodnar, G.M. 2009. No Place to Hide: the Global Crisis in Equity Markets in 2008/09. *Journal of International Money and Finance*, Vol. 28, No.8, pp. 1246-1292.
- [4] BenSafta, M.K., Smedo, G. 2005. *Contagion Analysis in Financial Crisis Period: Application of ICSS-MGARGH Model*, GERCIE, Tours University Press.
- [5] Black, F. 1976. Studies of Stock Price Volatility Changes, Proceeding of the 1976 Meetings of the American Statistical Association, Business and Economical Statistics Section, pp. 177-181.
- [6] Bollerslev, T. 1986. Generalised Autoregressive Conditional Heteroskedasticity. *Journal of Econometrics*, Vol. 31, pp.307-327.
- [7] Bollerslev, T., Litvinova, J., Tauchen, G. 2006. Leverage and Volatility Feedback Effects in High-frequency Data. *Journal of Financial Econometrics*, Vol. 4, No. 3, pp. 353-384.

- [8] Boujelbène, A.M., Boujelbène, Y., Bouri, A. 2009. Overconfidence bias: explanation of market anomalies French market case. *Journal of Applied Economic Sciences*, Vol. IV_Issue1 (7), pp. 12-26.
- [9] Campbell, J.Y., Grossman, S.J., Wang, J. 1993. Trading Volume and Serial Correlation in Stock Returns. *The Quarterly Journal of Economics*, Vol.108, pp. 905-939.
- [10] Campbell, J.Y., Hentschel, L. 1992. No News is Good News: An Asymmetric Model of Changing Volatility in Stock Returns. *Journal of Financial Economics*, Vol. 31, pp.281-318.
- [11] Christie, A.A. 1982. The Stochastic Behavior of Common Stock Variances - Value, Leverage and Interest Rate Effects. *Journal of Financial Economics*, Vol. 10, pp. 407-432.
- [12] Cunha, C.M.P. 2009. *Disposition effect and asymmetric volatility of individual stocks*. Pontificia Universidade Católica do Rio de Janeiro (PUC-Rio) Press, Rio de Janeiro.
- [13] Engle, R. 1982. Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of U.K. Inflation. *Econometrica*, Vol. 50, pp. 987-1008.
- [14] Frazzini, A. 2006. The Disposition Effect and under reaction to News. *Journal of Finance*, Vol. 61, No. 4, pp. 2017-2046.
- [15] French, K.R., Schwert, G.W., Stambaugh, R. 1987. Expected Stock Returns and Volatility. *Journal of Financial Economics*, Vol. 19, pp. 3-29.
- [16] Grinblatt, M., Han, B. 2005. Prospect Theory, Mental Accounting, and Momentum. *Journal of Financial Economics*, Vol. 78, pp. 311-339.
- [17] Hibbert, A.M., Daigler, R.T., Dupoyet, B. 2008. A Behavioral Explanation for the Negative Asymmetric Return-volatility Relation. *Journal of Banking and Finance*, Vol. 32, pp.2254-2266.
- [18] Kahneman, D., Tversky, A. 1979. Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, Vol. 47, pp. 263-291.
- [19] Low, C. 2004. The Fear and Exuberance from Implied Volatility of S&P 100 Index Options. *Journal of Business*, Vol.77, pp. 527-546.
- [20] Nikkinen, J., Omran, M.M., Sahlström, P., Äijö, J. 2008. Stock Returns and Volatility Following the September 11 Attacks: Evidence from 53 Equity Markets. *International Review of Financial Analysis*, Vol. 17, pp. 27-46.
- [21] Pindyck, R.S. 1984. Risk, Inflation and the Stock Market. *American Economic Review*, Vol. 74, pp. 334-351.
- [22] Poterba, J.M., Summers, L.H. 1986. The Persistence of Volatility and Stock Market Fluctuations. *American Economic Review*, Vol. 76, pp.1142-1151.
- [23] Schwert, G.W. 1989. Why Does Stock Market Volatility Change over Time? *Journal of Finance*, Vol. 44, pp.1115-1153.
- [24] Shefrin, H., and Statman, M. 1985. The disposition to Sell Winners too early and Ride Losers too Long: Theory and Evidence. *Journal of Finance*, Vol.40, pp.777-790.

THE ANALYSIS OF THE MANAGEMENT OF ROMANIAN INVESTMENT FUNDS USING ECONOMETRIC METHODS

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Abstract:

The object of this particular research paper is the analysis of all five investment funds in Romania, having five or more years of continuous activity on the Romanian capital market, through 60 monthly probes. Within a context of a macroeconomic environment characterized by uncertainty, a correct assessment of an investment prior to its inception becomes impetuously necessary. The starting point of this research was facilitated by similar studies in the field such as Sinclair (1990) Phoon, Tan (1993), Gallo, and Swanson (1996). The methodology of research includes testing of managerial abilities based on the established models of Jensen (1968), and Henriksson, and Merton (1984). The added value of this paper consists in the inclusion of two other aspects: namely the yield and the global risk associated to the portfolio using the CAPM model and the stationarity analysis of the series based on the Ljung-Box and the Box-Pierce tests. One of the conclusions of this research was that none the fund managers have either "selection ability" or "timing ability". However, risk and return analysis determined that the same group of managers achieved a harmonious grouping of the companies in their respective portfolios. As a result of the analysis performed, all data series were proven to be non-stationary, the funds themselves presenting a type DSP non-stationarity compared to the TSP type non-stationarity of the BET index series. Therefore, we used differentiation for the fund share price value and we have eliminated the trend of the BET index series using the Moving Average.

Keywords: selection ability, timing ability, risk, yield, volatility, stationarity

1. Introduction

The aim of this research was a performance assessment of all five investment funds in Romania with a constant activity on the market of at least five years, using the appropriate methodology in the field, based on econometric models and previous similar studies. The analysis is based on the share price value of the investment funds, the share price value of the companies in the respective portfolios, the BET index, and the ROBOR rate with a maturity of three months.

The data gathering method employed periodic samples from the web sites of the specific funds, The Romanian Stock Market, and the National Bank of Romania. The study is based on 60 monthly probes over a time period of five years, specifically from December 2005 through December 2010. All retrieved data was computed through Excel and SPSS. Similar studies assessing managerial abilities have been performed by various economists worldwide: Henriksson (1984) established that none of the 116 analyzed U.S. funds were endowed with "timing ability". A similar conclusion was drawn by Sinclair (1990) based on a case study of 16 Australian funds, with the notable exception of only one fund which presented the above named ability. Using the same methodology Koh, Phoon, Tan (1993) in Singapore, and Gallo, and Swanson (1996) concluded that none of the fund managers proved "timing ability", but some did display "selection ability."

This research is based on the same methodology employed in the above mentioned studies and is structured into six distinct parts. The first part consists of the starting point of the study. Throughout the second we have tested the efficiency of the Romanian capital market. The two abilities, "timing" and "selection" based on the Jensen's Alpha (1968), and the Henriksson, and Merton (1984) models, were the object of the study in its third section. The CAPM model based on which we determined the correlation coefficients between the stocks, the volatility coefficients, risk and portfolio yield were examined in the fourth part. In the fifth section we tested the stationarity of all series, the last part being left for conclusions.

2. Capital Market Efficiency

An efficient capital market entails a full and unhindered access to information for all players with the sole aim that speculation will not occur. The graph below reveals a significant drop in share prices on June 29th 2010, generated by the introduction of a new 16% capital gains tax coming into

effect on the same day. This drop was followed by a market raise of 1.9% the next day driven by the hope of a temporary readjustment of stock prices. This event proves the inefficiency of the Romanian capital market.¹



Figure 1. BRD stocks fluctuation for 6 months

Source: http://www.ktd.ro/bursa/bvb_grafice.php?id=6

Table 1 reflects the summary of transactions on the Romanian Stock Exchange (BVB). As shown, all companies suffered sharp drops on that particular trading day.

Table 1. Summary of the Romanian Stock Exchange on 29.06.10

1.	Erste Bank Sparkassen AG [EBS]	117,1000	-1,60% ↓	2.469	288.903,70	23
2.	BRD Societe Generale [BRD]	10,5000	-1,87% ↓	648.015	6.796.970,50	314
3.	CNTEE Transelectrica, Bucuresti [TEL]	16,0000	-3,03% ↓	6.620	106.025,00	82
4.	Petrom [SNP]	0,2930	-3,93% ↓	2.676.748	786.434,97	170
5.	Banca Transilvania [TLV]	1,3400	-4,29% ↓	750.438	1.006.989,45	231
6.	SIF Muntenia [SIF4]	0,5800	-4,92% ↓	381.486	222.640,56	

Source: data gathered and computed <http://www.ktd.ro>

Based on the above we can conclude that the Romanian capital market is inefficient since we could specifically determine the causes behind the analyzed fluctuations.

3. Testing managerial abilities

In order to test managerial abilities it needs to be determined whether the fund managers choose to purchase the stocks that will return a higher profit than the market rate. In other words, if they buy when the stocks are undervalued and sell them when overvalued, in order to obtain the highest possible profit.

Jensen, and Henriksson Models are used to test the two managerial abilities.

3.1. The selection ability test- α Jensen Model

Literature in the field underlines three great models for the evaluation of operative programming and selection ability. In the first phase the assessments focuses on the performance of the fund manager through the Jensen's alpha Model, which entails testing the selection ability of those stocks which yield above market profit².

The general formula of the Model is:

$$R_{pt} - R_{ft} = \alpha_j + \beta^*(R_{mt} - R_{ft}) + u_{pt} \quad (1)$$

Where:

R_{pt} = portofolio yield;

¹<http://www.zf.ro/burse-fonduri-mutuale/de-astazi-toate-castigurile-la-bursa-se-impoziteaza-cu-16>

² Jensen, M. 1968. *The performance of mutual funds in the period 1945-1964*, The Journal of Finance, Vol. 23, pg. 389-461.

R_{ft} = risk-free rate;
 α_j = alpha' Jensen
 β^* = volatility coefficient;
 R_{mt} = average market yield.

This model requires testing α_j significance. Having *selection ability* presupposes that α_j derived from the Regression table should be statistically significant different than zero and, at the same time, positive.

Table 2. α 's Jensen test results

Name of investment fund	α Jensen value
Active dinamic	-0.003
BCR Expert	0.290
BT Maxim	-0.005
Omninvest	-0.119
KD Maximus	-0.002

Source: determined by the authors

It can be observed that α Jensen is insignificantly different than zero from a statistic point of view for all five funds. Therefore, none of the fund managers displayed selection abilities meaning they included in their portfolios stocks yielding lower than the market average.

Table 3. Regression- α Jensen for *FDI Omninvest*

		Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Alpha	Intercept	-0.01191	0.009308	-1.2798	0.205801	-0.03055	0.006727
	X Variable 1	0.510611	0.083403	6.122195	9.07E-08	0.343599	0.677623

Source: determined by the authors

$\alpha = -0.1191$ for the *Omninvest fund*, hence this manager does not have selection ability.

$$Ex.p. = -0.01191 + 0.510611 Ex.mk. \tag{2}$$

In the event of the same value but a positive alpha Jensen, the result would have been statistically insignificant, resulting in the same conclusion; that the fund does not surpass market performance. This result is similar for all the other four funds.

3.2. The *timing ability test* – Henriksson, and Merton Model

The general formula of the Henriksson, and Merton Model is:

$$R_{pt} - R_{ft} = \alpha_T + \beta_u * X_{ut} + \beta_d * X_{dt} + u_{pt} \tag{3}$$

Where:

$$X_{ut} = \max [0, R_{mt} - R_{ft}];$$

$$X_{dt} = \min [0, R_{mt} - R_{ft}]$$

u_{pt} = error, random

$(R_{pt} - R_{ft})$ = Fund's return series- Risk-free rate

The main advantage of using this particular Model is that it clearly distinguishes between the two abilities. $\beta_{up} > \beta_{down}$ reflects “market timing ability” of the manager, as shown in table 4.

Table 4. Regression results Henriksson and Merton (α , β_u , β_d)

Name of the fund	A Value	β up value	β down value
Active Dinamic	0.041256	0.65	0.7
BCR Expert	-0.13973	0.56	0.68
BT Maxim	0.22	0.65	0.81
Omninvest	-1.42	0.47	0.44
KD Maximus	0.03	0.45	0.46

Source: determined by the authors

The Table 4 above clearly shows that $\beta_{up} > \beta_{down}$ for four of the five funds. In the case of the *Omninvest fund*, although fulfilling the necessary condition, the Student test proves the manager to be a “poor market-timer” as well (see table 5 below).

Table 5. Regression- α , β_u , β_d FDI Omninvest

	Coefficients	Standard Error	t Stat	P-value	Lower 95%
Intercept	-1.42931	1.425819	-1.00245	0.320441	-4.28556
X Variable 1	0.570646	0.183709	3.106251	0.002973	0.202633
X Variable 2	0.440584	0.124176	3.548045	0.000794	0.191828
	0.130063	0.22174	0.586553		
Rp-Rf=-1.42931+0.57Xu+0.44Xd+u					
Beta up	Beta down, Beta up- Beta down= 0.130063			t stat	
			Alfa	-1.42931	
			Beta up	3.106251	
			Beta down	3.548045	
			t student	0.586553	< t Student theoret=2.003241

Source: determined by the authors

Following the two testing methods it can be concluded that none of the fund managers displayed either “selection ability” or “operative programming ability”.

4. The CAPM Model

The Capital Asset Pricing Model was independently developed by William Sharpe (1964), and John Lintner (1965, 1969), promoting of a direct link between the yield of a financial instrument and the return of a portfolio via a risk index.³

The underlining concept of the CAPM model is: the rational behavior of the investor has only one ultimate goal- the profitable return on investment.

The general formula of the rate of return on investments or, simply put, return rate, within the CAPM model is:

$$r = \frac{p_1 + d - p_0}{p_0} \quad (4.1.) \quad (4)$$

Where:

p_1 = closing price of the share at the end of the month

p_0 = closing price of the share at the beginning of the month

d = dividends (if any) paid throughout the month.

Table 6 displays the results for each of the 5 investment funds, namely, the return and risk associated.

³<http://www.kmarket.ro>

Table 6. Annual yield and risk associated to the investment funds

Name of the fund	Annual yield	Risk
Active dynamic	21%	10%
BCR Expert	41.88%	20%
BT Maxim	35.40%	18.62%
Omninvest	32.64%	11.5%
KD Maximus	30.61%	13.90%

Source: determined by the authors

Investor preference for higher rather than smaller returns is unanimous as long as everything stays the same. Generally, investors prefer a smaller standard deviation, should it ultimately lead to the same expected yield. A higher risk can be deemed acceptable only if it is strictly correlated to a higher return.

Based on the computed results, it can be inferred that the BCR Expert fund displayed the highest annual return on the portfolio, 41.88% and, at the same time, the highest risk, 20%, measured through the square standard deviation. According to our research, the best risk to yield ratio was obtained by the Omninvest fund with a return of 32.64% and an associated risk of 11.5%.

The ideal situation requires that the investor should achieve a harmonious grouping of the proportion of each stock within the portfolio. Therefore, the general outcome would ensure that the overall risk of the portfolio would be lower than the individual risk of each stock, optimizing the risk-return profile of that particular portfolio.

The general formula of a portfolio with four stocks is:

$$R = \sqrt{\alpha_1^2 \zeta_1^2 + \alpha_2^2 \zeta_2^2 + \alpha_3^2 \zeta_3^2 + \alpha_4^2 \zeta_4^2 + 2(\alpha_1 \alpha_2 \zeta_1 \zeta_2 \delta_{1,2} + \alpha_1 \alpha_3 \zeta_1 \zeta_3 \delta_{1,3} + \alpha_1 \alpha_4 \zeta_1 \zeta_4 \delta_{1,4} + \alpha_2 \alpha_3 \zeta_2 \zeta_3 \delta_{2,3} + \alpha_2 \alpha_4 \zeta_2 \zeta_4 \delta_{2,4} + \alpha_3 \alpha_4 \zeta_3 \zeta_4 \delta_{3,4})} \quad (5)$$

Where:

α_i = weight of share “i” within the portfolio

ζ_i = risk rate associated to share “i”

$\delta_{i,j}$ = correlation coefficient between “i” and “j” shares

The purpose of the analysis in this chapter was to determine whether the managers of the investment funds achieved a harmonious grouping of the stocks in their portfolios or not. A noteworthy fact is that the risk associated with the Omninvest fund was 11.5% throughout the analyzed months, a percentage value which is closely related to the 10.5% Romanian capital market risk rate for the same period. Therefore, the yield of 32.64% for this investment fund represents a positive signal for potential investors. Moreover, the risk associated to this fund was indeed lower than the risk rate of all individual components in this portfolio: SOCP 13.8%, ARS 21.54%, ART 20%. Hence this represents a clear case of a harmonious grouping of the stocks, by the fund manager.

The annual yield of the BT Maxim fund was 35.4%, lower than SIF5 at 68.28%. The portfolio risk rate was 18.62% for the BT Maxim fund versus SIF2 22.38%, SIF1 20.93%, SIF5 24%, but higher than the risk level associated with Transilvania Bank of 17.9%. It can be concluded that should the manager of this particular fund have opted for a different amplitude level of the stocks in the portfolio, the total associated risk might have been lower and, therefore, more inciting to the investors. However, the high rate of return of this fund can make it an attractive investment option (see table 7. below).

Table 7. Annual rate of return, risk and volatility coefficient for all stocks in the portfolios

Symbol of the stock	Annual yield	Associated risk	β coefficient
SIF1	25.2%	20.93%	1.48
SIF2	36%	22.38%	1.61
SIF4	26.28%	14.6%	1.07
SIF5	68.28%	24.01%	1.68

Symbol of the stock	Annual yield	Associated risk	β coefficient
BRD	36.72%	14.21%	1.19
SNP	12.6%	12.84%	1.063
TLV	12.36%	17.9%	0.67
SOCEP	37.44%	13.8%	0.45
ARS	140.16%	21.54%	0.78
ART	2.4%	20%	0.94

Source: determined by the authors

The beta coefficient is expressed by the slope of regression line and reflects the volatility of the return rate of the share “i” to market fluctuation. This indicator was determined based on covariance and the correlation coefficients.⁴

Through an interpretation of the computed results we can observe a beta coefficient higher than 1 for the first 6 stocks. Therefore, we can infer a high volatility rate for the shares of all SIF units, BRD and Petrom. These types of shares are also commonly known as offensive or aggressive, having a more significant variation in relation to the market. As a direct opposite the shares of Aerostar, Artcom, SOCEP, Transilvania Bank displayed a sub-unitary β which denotes a volatility lower than the broad-based index. Therefore, under recession circumstances or market stress, they decrease slower than the market, and during periods of economic growth they lag behind the market trend.

A conservative investor, preoccupied with the preservation of capital will base stock acquisitions on a lower β coefficient of the individual share, whereas an investor with a higher risk tolerance will have a proclivity for high β shares.

5. Series stationarity

Literature defines a stationary series as being one that has neither trend, nor seasonality and is homogenous in respect to time. One of the dominant features of most economic time series is non-stationarity. Such series are characterized by evolution trends and heteroelasticity. The trend behavior can be upward or downward, exponential or linear. Economic time series are endowed with a homogenous non-stationarity, meaning they are series which following certain transformations become stationary. By means of the Q test of Box-Pierce and LB test of Ljung-Box, in figure no. 5.1 we performed an analysis in order to determine the stationarity or the lack thereof for the BET index series and the share price value of all five investment funds.⁵

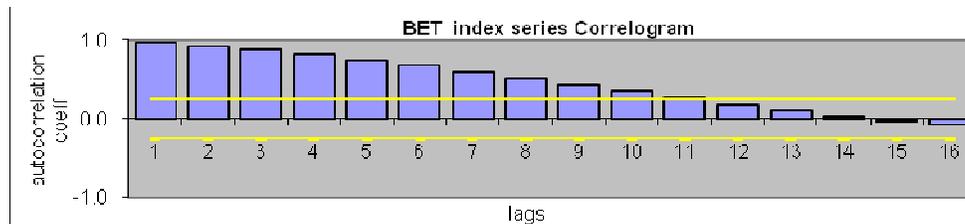


Figure 2. BET index lag correlogram

Source: determined by the authors

Fig. 2 presents the correlogram of the BET index series lags. Similarly we have drawn-up correlograms for each individual series in order to establish by graphic means as well, the fulfillment of the stationarity prerequisites. Through a graph analysis we can concur that the lags of the series are not bound by the confidence interval. In the BET index series case they surpass the upper limit of the

⁴ Griffiths, W.E., Carter, Hill R., Judge, J.G. 1993. *Learning and practicing econometrics*. Ed. John Wiley& Sons, Singapore, pg. 42.

⁵ Ljung, G.M, Box, G.P.E. 1978. *One a measure of Lack of Fit in Time Series Models*, Biometrika, no.66/1978.

interval; therefore, the series is non-stationary. A similar conclusion was reached for all five investment funds' series.⁶

The LB value for the Ljung-Box test and the Q value for the Box-Pierce test were determined as reinforcement for the stationarity analysis of all series.

$$LB = n(n + 2) \sum_{j=1}^k \left(\frac{r_j^2}{n - j} \right) \tag{6}$$

$$Q = n \sum_{k=1}^m r_k^2 \tag{7}$$

The results corroborate the graph analysis. Comparing Q and LB values with the reference chart value $\chi^2=26.29623$ ($\alpha =5\%$, 16 degrees of freedom) it can be noticed that $Q, LB > \chi^2$. Therefore, the H_0 hypothesis is rejected, meaning there are r_k significantly different than 0, hence the series are non-stationary (results shown in table 8 below).

Table 8. Box-Pierce and Ljung-Box determined values

Name of the series	Q-value Box-Pierce test	LB value- Ljung-Box test
BET Index	313.81	349.5
FDI Active dinamic	278.76	309.5
FDI BCR Expert	330.53	369.87
FDI T Maxim	312.41	347.67
FDI Omninvest	355.43	399.29
FDI KD Maximus	252.89	284.55
Reference value	26.29623	26.29623

Source: determined by the authors

In order to transform the series into stationary ones, a testing of the non-stationarity type was performed. The use of multiple regression was employed in order to establish whether the evolution of each individual series (regressand) depends on the following exogenous variables: the precedent value (y_{t-1}) as well as the time factor (ti). The intended econometric model was:

$$Y_t = f(y_{t-1}, ti) = a_0 + a_1 y_{t-1} + a_2 ti \tag{8}$$

We show the results in table 9 below.

Table 9. Regression- *Active Dinamic fund* - y_{t-1} and time as regressors

$R=0.96,$ $R^2=0.93$	$SigF=2.686E-33$	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.817567	0.63791	1.281633	0.205252	-0.46032	2.095454
X	0.941159	0.040964	22.97502	3.47E-30	0.859098	1.023221
X	-0.01635	0.012809	-1.27651	0.207044	-0.04201	0.009308

Source: determined by the authors

The average bond intensity between the dependent variable and the explanatory ones is 96%, moreover, the linear model explains 93% of the Active Dinamic fund variation. The Fisher test shows that the regression is significant, starting at a significance threshold of $2.686E-33 \approx 0$, indicating with a probability of 100% that the regression is globally significant.

$$Y_t = 0.817567 + 0.941159 y_{t-1} - 0.01635ti \tag{9}$$

⁶ Popescu, T. 2000. *Serii de timp –Aplicatii in analiza sistemelor*. Ed Tehnica, Bucuresti, pg 24.

The coefficient attributed to the time factor over the Active Dinamic fund, X Variable 2 = - 0.01635 is insignificantly different than zero. Therefore, the time factor has been completely discarded out of the model, no longer being an exogenous variable in this particular regression (see table 10).

Table 10. Regression-the *Activ Dinamic fund* - y_{t-1} influence-new econometric model

$R=0.96, R^2=0.93$	$Sig F=1.73E-34$	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.418174	0.558971	0.748114	0.457467	-0.70115	1.537493
X Variable 1	0.967988	0.035355	27.37888	1.74E-34	0.897191	1.038786

Source: determined by the authors

The new econometric model for the Active Dinamic fund becomes: (similar for all other investment funds)⁷.

$$y_t = 0.418174 + 0.967988 y_{t-1} \tag{10}$$

The average bond intensity between the regressand and the regressors is 96%. The linear model explains 93% of the Active Dinamic fund variation. The Fisher test shows us that the regression is significant, starting at a significance threshold of $1.73E - 34 \approx 0$, indicating with a probability of 100% that the regression is globally significant.

Figure 3 reveals the serial correlation at the point t and t-1 for the Active Dynamic fund.

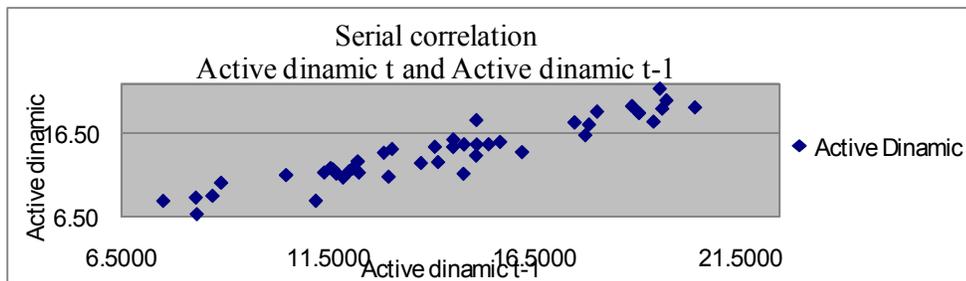


Figure 3. Active Dynamic fund $t, t-1$ correlation

Source: determined by the authors

The investment fund series proved a non-stationarity of the DSP („difference stationary process”) type. They become stationary through applying a seasonal differentiation calculus of the first or second integration order.⁸

We define the first and second order differentiation as:

$$y_t' = \nabla y_t = y_t - y_{t-1} \tag{11}$$

$$x_t' = \nabla^2 x_t = \nabla x_t - \nabla x_{t-1}. \tag{12}$$

Following a first order differentiation process, five out of six series became stationary⁹, as shown in Table 11 below.

⁷ Griffiths, W.E., Carter, Hill R., Judge J.G. 1993. *Learning and practicing Econometrics*, Ed. John Wiley&Sons, Singapore, pg. 16.

⁸ Kirchgassner, G., Wolters, J. 2007. *Introduction to Modern ime Series Analysis*, Ed Springer, New York, pg 159.

⁹ Popescu T. 2000. *Serii de timp-Aplicatii in analiza sistemelor*, Ed Tehnica, Bucuresti, page 7.

Table 11. Box-Pierce and Ljung-Box test results upon new stationary series

Name of the series	Q value- Box-Pierce test	LB value- Ljung-Box test
FDI BCR Expert	19.07	18.45
FDI BT Maxim	19.42	18.78
FDI Omninvest	13.36	12.93
FDI KD Maximus	22.5	21.74
Reference value	26.29623	26.29623
FDI Active dynamic	27.83	26.9

Source: determined by the authors

The Active Dinamic fund series required a second differentiation process, which resulted in $Q = 8.17$ and $LB = 7.89 < 26.29623$ (Reference value), hence the series became stationary with an integration order equal to 2.

The BET index series proved to be of the TSP („trend stationary process”) type due to the time factor influence over the evolution of this particular series. The regression is globally significant with a probability of 100% starting at a threshold of $1.32E - 32$, according to the Fisher test. The average bond intensity between the regressand and regressor is 96% and the linear model explains 92% of the BET index variation (see table 12 below).

Table 12. Regression-BET index series - y_{t-1} and time as exogenous variables

$R=0.96,$ $R^2=0.92$	Significance $F=1.32E-32$	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	472.3432	314.6343	1.501245	0.13891	-157.945	1102.631
X Variable 1	0.921216	0.04806	19.16823	2.85E-26	0.824941	1.017491
X Variable 2	-8.58703	6.316214	-1.35952	0.179431	-21.2399	4.065868

Source: determined by the authors

The new econometric model becomes:

$$Y_t = 472.3432 + 0.9212 y_{t-1} - 8.587t_i \tag{13}$$

The TSP type series have the potential to be transformed into stationary series via trend elimination.¹⁰

$$x'_t = x_t - \hat{x}_t \tag{14}$$

Where: \hat{x}_t trend
 $\{x'_t\}_t$ stationary series

Figure 4 underlines the presence of a trend line for the BET index series. Trend elimination was performed through the Moving Average Method. The result consisted in yet another non-stationary series.

¹⁰Kirchgassner, G., Wolters, J. 2007. *Introduction to Modern ime Series Analysis*, Ed Springer, New York, pg.171.

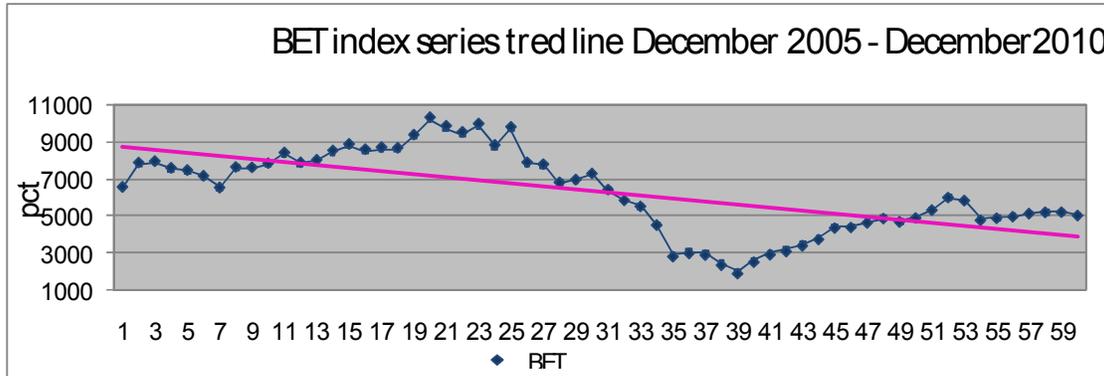


Figure 4. BET index series –trend line

Source: determined by the authors

Figure 5 presents the BET index series following trend elimination on the left and first order differentiation to the right. The graph clearly shows that following differentiation the BET index series becomes stationary since the values fall between the confidence interval, unlike the previous case.

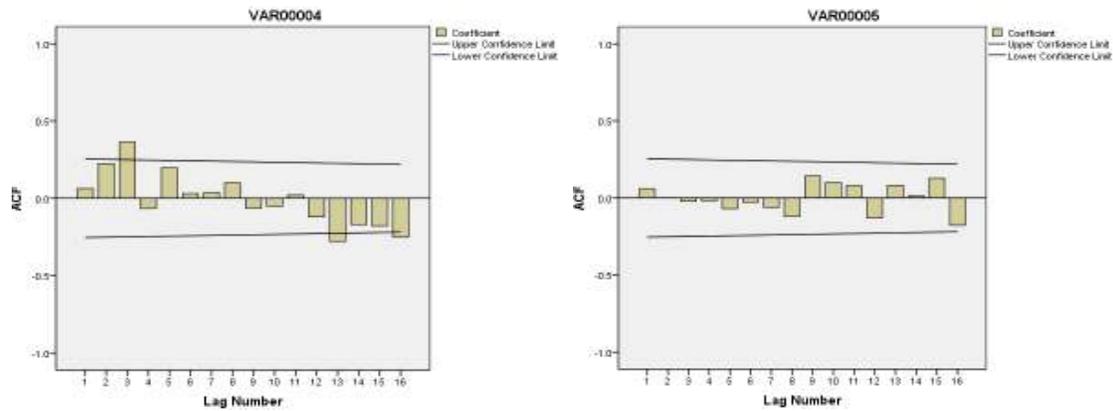


Figure 5. BET series index –1. Trend elimination-2.First order differentiation

Source: determined by the authors

Both trend elimination and first order differentiation needed to be performed in order for the series to become stationary (see Table 13 below).

Table 13. Box-Pierce and Ljung-Box test results upon BET index series

Name of the series	Q value-Box-Pierce Test	LB value- Ljung-Box Test
Seria indice BET	2.507	2.42

Source: determined by the authors

Table 13 reinforces the stationarity of the BET index series based on the LB and Q values.

6. Conclusions

This research has been conducted on two tier approach by attempting to analyze both past performance and a future line of development for the market and for the five investment funds respectively. The analysis conducted showed that none of the five fund managers displayed either

“timing” or “selection ability”. The lack of such abilities can be a byproduct of the proven capital market inefficiency. Another possible reason suggested by a similar study by Nikolaos Philipas under the aegis of the University of Piraeus of 19 mutual funds in Greece (January 1993-December 1997) consists in the lack of managerial experience due to the short term presence and overall “youth” of the funds on the market. This conclusion was based on the alpha Jensen indicator which registered negative values for four of the five analyzed funds. Unlike the results of the Greek study none of the β Henriksson and Merton values were negative. Therefore, it can be affirmed that without being “glittery”, the abilities of the Romanian managers outpaced those of their Greek counterparts.

The BCR Expert fund displayed the highest annual return on the portfolio, 41.88% and, at the same time, the highest risk, 20%. According to our research, the best risk to yield ratio was obtained by the Omninvest fund with a return of 32.64% and an associated risk of 11.5%.

The highest annual rate of return on a share belonged to Aerostar with a value of 140.16% and an associated risk of 21.54%, and the lowest rate of return was displayed by Artcom, with only 2.4% per year and a five times higher risk, both companies being part of the Omninvest fund.

The most harmonious structure of a portfolio was attributed to the Active Dinamic fund, the risk associated with this particular investment fund being lower than the risk rated for all individual companies in its portfolio.

As a result of the analysis performed, all data series were proven to be non-stationary, the funds themselves presenting a type DSP non-stationarity compared to the TSP type non-stationarity of the BET index series. Using non-stationary time series data in financial models leads to the inability to accurately forecast. The solution is to transform the financial series data into stationary. Therefore, we used differentiation for the fund share price value and we have eliminated the trend of the BET index series using the Moving Average.

The purpose of transforming all series into stationary ones was to make previsions of their evolution in the future. The obtained results, however, do not allow such forecasting, since the new stationary series contain negative values, a fact never to be seen in practice neither for the BET index series nor for the series of the share values of the investment funds. Such fact, however, does not affect either the quality of the analysis or the pertinence of the results derived from this research. Regardless of the method, a correct assessment of an investment prior to its inception remains an impetuously necessary analysis to do in order to secure the highest possible yield on that particular investment.

References

- [1] Andrei, T., Bourbonnais, R. 2008. *Econometrie*. Editura Economică, București, in *Romanian*.
- [2] Gallo, J., Swanson, P. 1996. Comparative Measures of Performance for US Based International Equity Mutual Funds. *Journal of Banking and Finance*, Vol. 20, No. 10.
- [3] Griffiths, W.E., Carter, Hill R., Judge, J.G. 1993. *Learning and practicing econometrics*, Ed. John Wiley& Sons, Singapore.
- [4] Henriksson, R. 1984. Market Timing and Mutual Fund Performance: An Empirical Investigation. *Journal of Business*, Vol. 57, No.1,
- [5] Henriksson, R., Merton, R. 1981. On Market Timing and Investment Performance. *Journal of Business*, Vol. 57, No. 4,
- [6] Jensen, M. 1968. The performance of mutual funds in the period 1945-1964. *The Journal of Finance*, Vol. 23.
- [7] Kirchgassner, G., Wolters, J. 2007. *Introduction to Modern time Series Analysis*, Ed Springer, New York.
- [8] Koh, F., Phoon, K.F., Tan, CH. 1993. Market Timing Abilities of Fund Managers: Parametric and non Parametric Tests. *Journal of Business, Finance and Accounting*, Vol. 20, No. 2.
- [9] Ljung, GM., Box, G.P.E. 1978. One a measure of Lack of Fit in Time Series Models, *Biometrika*, no.66/1978.

- [10] Phillipas, N, Market Timing and Selectivity: An empirical Investigation into features of Greek mutual fund managers. *The Journal of Applied Business Research*, Vol. 18, Nr.3.
- [11] Popescu, T. 2000. *Serii de timp –Aplicații în analiza sistemelor*. Editura Tehnică, București, in Romanian.
- [12] Sinclair, N.A. 1990. Market Timing Ability of Pooled Superannuation Funds. *Accounting and Finance*.
- *** <http://www.bvb.ro>
- *** <http://www.ktd.ro>

CONSIDERATIONS UPON ANGLICISMS IN THE FIELD OF ROMANIAN ECONOMIC LANGUAGE

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Abstract

The new historical context, with all its implications at the political, economic, social, technological, cultural levels has definitely marked language, which began to reflect by its increased dynamism, particularly in its lexical compartment, the current Romanian reality and transformations. The paper tackles the issue of Anglicism in Romanian economic language and emphasises matters concerning the causes and justifications that determined their use to such a great extent during the past decades.

Key words: *anglicisms, vocabulary, borrow, reality, attitude.*

The last 20 years of Romanian history marked by the transition from a totalitarian system to a democratic one have left a deep imprint on the political, social, economic, technical, scientific, cultural and day-to-day life of the country. The transition from a planned economy to a free market economy, from a single party system to a multiparty one, from censorship to freedom of speech and expression, in a word, the transition from dictatorship to democracy entailed profound changes in all areas, illustrated by vocabulary - the most unstable of all language compartments. [Graur, (1978: 5)]

As long as changes in vocabulary are parallel with the society's evolution, the Romanian lexicon has been unquestionably marked by the new historical context, which began to mirror the current Romanian realities and transformations. New words that were absent before appeared concurrently with the object or concept they defined. [Graur, (1978: 6)] Under these circumstances, year after year, with each change in any of the areas mentioned, Romanian has stepped up to the otherwise normal process of borrowing foreign words, keeping up with the new realities of the material and spiritual life.

As English has become a global language and as the high-technology scientific advances and political terminologies coming from English speaking countries determined people to learn English, so that they can benefit from them [Crystal, (1977: 80)], so much the greater the Romanian speakers' need and desire alike to use English neologisms. The impetus given to all fields brought a wave of anglicisms meant to fill large voids of denomination. [Chelaru-Murăruș, (2011)].

Necessary or not, used with more or less justification, these loans entered the vocabulary of the native speakers who, especially in urban areas, have quickly changed their mentality and outlook on life by direct contact with other peoples' culture and civilization and have enthusiastically acquired a series of Anglo-American neologisms without which communication seems impossible today: everybody has a *job* or goes *shopping* - in a *supermarket*, *hypermarket* or a *mall* of course, because this is *trendy* or *cool*, and it is only there that one can find the best *brands*, pay in *cash* or with a *credit card*, see a *thriller* or have a *hamburger* or a *shake* in a *fast food* with or without *discount*; everybody wants a new *look* so he/she uses the services of a *hair stylist* or *make-up artist*, goes *jogging*; everybody *applies* for something or attends a *casting* or an *interview* for a new *show*, *talk-show*, or *workshop*; everybody wants to be at the *top*, or a *VIP* having a *blog* or a *site* to give life to their thoughts *online*; everybody pretends to perform *live* or to run a profitable *business*, being either *stars* or *business people* that are part of a *board*.

There are many justifications for such a reality and attitude, characteristic of the other countries of the former communist camp.

It was at first the extraordinary contact people began to have with a relatively new language for them, the language of the sundry television channels or movies which had been banned for

decades, the language of communication, trade, business, newly emerging national media, the language that was common to a world they had been isolated from for generations. English began to be intensively studied in kindergarten and schools later alongside with other subjects - informatics for example - which extended the possibilities of learning terms belonging to different fields of interest. Public and private universities widened and diversified their educational offers by introducing in their curricula new specializations that required the use of new concepts more clearly defined by English or American neologisms. Not to mention that there appeared new social phenomena, processes, institutions, goods that Romanians had not known previously and had to be denominated by new lexical units able to satisfy the communication process properly.

Then the desire to break completely from everything that meant articulation in the insipid language reminiscent of the communist era prevailed.

Last but not least it was the speakers' wish to speak more "carefully", in a more "literary style" urge that favoured the use of neologisms considered more "cultivated" more "elegant" to the detriment of ordinary, "banal" words, even if the lack of full synonymy between the old word and neologism distorted the semantic meaning of the statement or led to incorrect or unnatural combinations of words. [Guțu Romalo, (1972:158)]

A structural feature of Romanian is that, over the centuries, it was a hospitable host, borrowing directly or indirectly Slav, Turkish, Hungarian, Greek, German, French, English words belonging to different domains, which were adapted to its own phonetic system, morphology and spelling. Lexical borrowings from different areas of knowledge have contributed to the Romanian lexicon enrichment and modernization. This process was achieved mainly starting from the second half of the XVIIIth century and the beginning of the XIXth century so that, in the course of time, the lexical fund formed by neologisms was greatly increased by loans of various origins that in the 80s of the last century amounted to more than 40 000. [Hristea, (1981:43)] The French influence is considered the most important - it helped to the Romanian vocabulary modernization through thousands of words belonging to all domains: socio-political, military, administrative, economic, scientific, and medical. It is in this context that many English terms taken exclusively from French entered the Romanian language. But in the recent decades, a large number of English and American neologisms were borrowed by Romanian and their number continues to grow at an accelerated rate.

The issue of loans in Romanian, although long debated in the past, is still topical and enjoys the attention and concern of specialists, nowadays when the English influence is so prominent, because of at least two reasons: on one hand it is the protest of some of the experts, men of letters or simply ordinary people [Geo Dumitrescu, (1992); Octavian Paler (1997); *apud* Pruteanu (2006)] who animadverted the use of so many anglicisms, considering the phenomenon as harmful to the very existence and national quiddity of the language; on the other hand it is the very importance that these elements, that constitute a notable component of Romanian, have. [Avram, (1997: 7)]

This attitude towards the international phenomenon of anglicisms *invasion* is a world-class one, other states having faced this phenomenon for a longer span of time, as compared to Eastern Europe countries that perceive it with the same acuity but within another time interval and with greater rapidity, which exacerbates its strength.

But, as it is impossible to either prevented the obsolescence of some traditional words or the use of some necessary loans [Graur, (1998: 5)], what specialists consider important is not the vehement rejection of anglicisms but their correct assimilation, according to linguistic rules that should state the proper spelling and pronunciation for the Romanian territory, thereby avoiding the mistakes that are noticed in media [Hristea, (1978:5)]: *aiceberg, naylon (pronunciation and spelling combined) bussiness, caffeteria, fair-pley, indoor, pikap, shoching, speacher, spotsmen, wisky.*

As a matter of fact the phenomenon seems not to have, for the Romanian language, the sheer amplitude that is given today, as long as Andrei Bantaș (1982: 224) estimated, back in the 80's, at about 4,000 the number of neologisms (derived and compound words and phrases) of English origin. What makes the phenomenon seem an *invasion of anglicisms* can be explained by the opening that the Romanians had during the past decades to anything that the West meant - from culture to commerce. Continuous improvement of the means of communication increased the contact with people from different countries and continents from where there were taken over terms able to

accommodate the new situation or other words to replace the old ones that had become inadequate at a certain time. [Graur, (1978:9)]

The use of some of these loans, however, is unjustified in terms of linguistics as long as they hardly bring additional information and duplicate words of Romanian origin, replaced because of snobbishness and snugness [Hristea, (1978:5)] with what was called *luxury loans* [Pușcariu, (1976:371)], in our case *luxury anglicisms* [Stoichițoiu, (2008:115)], useless words, unaccounted by any cultural, scientific, economic need [Hristea, (1978:5)] that are but typical manifestation of *Anglomania* [Stoichițoiu, (2008:95)]: *advertising, agreement, board, brand, businessman, businesswoman, chairman, discount, full-time job, marketing manager, part-time job, program officer, sales manager, sales person, salesman, showroom, staff*, but also *shop* (frequently used in some Romanian shops' names), *shopping, shopping centre, food, drink*.

Another explanation of this perception is the need that experts from various fields felt to use more accurate terms to render the very meaning of some notion [Avram, (1987: 217)] or some extra linguistic realities that needed unequivocal terms, especially technical ones that require precision to be designated. For example, terms such as: *software, hardware, mouse, chat, e-mail, computer* entered the Romanian linguistic area because, in the field of computer science, the accurate translation could not be achieved through a Romanian equivalent. The relationships that different Romanian economic, financial and commercial entities have developed and maintained with foreign partners or peers required the use of a common, international, professional language made up of short, simple-structured, international words that have no the Romanian synonyms and fall into the category of specialized terms: *audit, broker, brokerage, buy-back, cash&carry, clearing, credit, dealer, design, designer, dumping, duty-free, electronic banking, futures, grant, holding, hypermarket, leasing, management, marketing, non-profit, offshore, outlet, rating, retail banking, supermarket, trust, voucher, wireless*, etc.

Some Romanian speakers, not only ordinary people - we certainly exclude from this category the snobs who use the English *job* instead of its Romanian equivalent - choose to sprinkle their communication with English neologisms, - *lost images*, the analysis of which leads, necessarily, without denial, to Latin [Tohăneanu, (1995:55)] - because they can be more exact, more eloquent, more emotional.

Conclusions:

Due to their international character the English and American neologisms are well preserved in the language they enter and the fact that they continue to be used is a clear indication that he was needed or that it became necessary through semantic specialization as compared to the Romanian synonyms they duplicated as was the case with loans such as: *cameraman, design, designer, optional, transnational, nutritional, decisional, to computerize, to institutionalize*. [Hristea, (1978:19)]

We consider we can assert that the use of English loans was generally an inner urge of Romanians and not necessarily something imposed from outside. This probably comes to explain the attitude of most Romanian linguists - diametrically antithetic to that of the French purists - who have consecrated their scientific research to purely linguistic aspects related to neologisms': etymology, means by which they came into use in Romanian, utilization and prevalence, spelling, phonetic, morphological issues, matters concerning their entry in dictionaries. [Stoichițoiu-Ichim, (2008:85)] These steps have helped the Romanian media that has a role in educating the public, in enrichment, diversity, internationalization of the literary language vocabulary. [Stoichițoiu-Ichim, (2008:85)]

References:

- [1] Avram, Mioara, (1987), *Probleme ale exprimării corecte*, București, Editura Academiei Republicii Socialiste România.
- [2] Avram, Mioara, (1997). *Anglicismele în limba română actuală*, in *Conferințele Academiei Române. Ciclul Limba română și relațiile ei cu istoria și cultura românilor*, Editura Academiei Române.
- [3] Bantaș, Andrei, (1982), *Aspects of Applied Semantics for Modernizing Bilingual Dictionaries*, in *Revue roumaine de linnguistique*, XXVII, nr.3.

- [4] Chelaru-Murăruș, Oana, (2011), *Limba română de azi: fals decalog*, in *Dilema veche*, nr. 389, 28 iulie - 3 august, <http://www.dilemaveche.ro>
- [5] Crystal, David, (1997), *English as a Global Language*, Cambridge University Press, Cambridge, UK.
- [6] Graur, Alexandru, (1978), *Dicționar de cuvinte călătoare*, București, Editura Albatros.
- [7] Guțu Romalo, Valeria, (1972), *Corectitudine și greșeală*, București, Editura Științifică.
- [8] Hristea, Theodor, (1978), *Despe scrierea și pronunțarea unor anglicisme*, in *România Literară*, nr.26, in *Romanian*.
- [9] Hristea, Theodor, (1981), *Sinteze de limbă română*, București, Editura Didactică și Pedagogică.
- [10] Pruteanu, George, (2006), *Anglicisme, neologisme, xenisme*, <http://www.pruteanu.ro/4doarovorba/emis-s-038-angl.htm>
- [11] Pușcariu, Sextil, (1976), *Limba română. vol.I - Privire generală*, București, Editura Minerva.
- [12] Stoichițoiu-Ichim, Adriana, (2008), *Vocabularul limbii române actuale. Dinamică / Influențe / Creativitate*, București, Editura All.
- [13] Tohăneanu, Ion, (1995), *Neologisme - imagini uitate*, in *Limbă și literatură*, vol.II, pp. 54-57.

ENVIRONMENTAL POLLUTION AND ECONOMIC DEVELOPMENT: EXPLAINING THE EXISTENCE OF AN ENVIRONMENTAL KUZNETS CURVE

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Abstract

In this paper we examine the concept of an Environmental Kuznets Curve (EKC) hypothesis in a critical way aiming to justify its existence as well as to propose policies compatible with sustainable development. For this reason, we make use of a data set on CO₂ emissions for 32 countries over a 36 year time period. For this balanced panel database, we apply a number of econometric methods to estimate the income-environment relationship. Our results indicate the existence of N-shaped relationship between economic development and pollution. However we show that the turning points calculated by panel data analysis may not reveal the actual turning points valid for individual countries. In our case and using different countries from different geographical regions we found a mixture of monotonic or inverted U-shape or N-shape behaviour. Countries are heterogeneous with different stochastic regression coefficients. This implies that the use of the total N-shape income-environment relationship by policy makers may be misleading with serious policy ineffectiveness implications.

Keywords: Environmental Kuznets Curve; Panel Data; CO₂ emissions.

JEL Classification: Q56, O20, C23.

1. Introduction

Kuznets (1955) showed that during the various economic development stages, income disparities first rise and then begin to fall. Degradation tends to be higher in many middle income countries in comparison to less developed countries. The environmental Kuznets curve (hereafter EKC) hypothesis proposes that there is an inverted U-shape relation between environmental degradation and per-capita income. In this paper, we examine the concept of an environmental Kuznets curve in a critical way with an eye towards proposing policies compatible with sustainable development. Environmental damage seems to be lower in the most developed countries compared to many middle-income countries and higher in many middle-income countries compared to less developed countries.

A number of alternative theories of the economy-environment relationship exist and are presented in Everett et al. (2010). Namely, the *limits theory* defines the economy-environment relationship in terms of environmental damage hitting a threshold beyond which production is so badly affected that the economy gets smaller. The *new toxics view* relies on the idea that emissions of existing pollutants are decreasing with further economic growth but the new pollutants substituting for them increase. This view questions the existence of turning points and considers the possibility that environmental damage continues to increase as economies grow (Everett et al., 2010). Similarly the *race to bottom theory* states that international competition initially leads to increasing environmental damage, up to the point when developed countries start reducing their environmental impact but also export polluting activities to poorer countries. The net effect, in the best case scenario, is a non-improving situation. Finally, the *Porter's Hypothesis* refers to growth and environment as a false dichotomy and finds that well-designed environmental policy can increase R&D into resource efficient products and processes, resulting in improved business competitiveness and profitability (Everett et al., 2010).

Empirical formulations of the environment-income relationship and the exploration of the EKC hypothesis rely on the econometric specifications that consist of an environmental damage indicator as depending on an economic variable representing economic development like GDP/c in level, square and cubic values as independent variables. Due to lack of data different variables have been used so far in empirical modeling to approximate environmental damage like air pollutants (SO_x, NO_x, CO₂, PM10, CO, etc.), water pollutants (e.g. toxic chemicals discharged in water, etc.) and other

environmental indicators (e.g. deforestation, municipal waste, energy use, urban sanitation and access to safe drinking water).

This paper is organized as follows. Section 2 discusses the existing theoretical and empirical work. Section 3 comments on the reasons for justifying an EKC, while section 4 presents the econometric models used in this study. The empirical evidence is presented in section 5. The final section concludes the paper.

2. Previous work

A number of authors have estimated econometrically the EKC using OLS analysis. The EKC estimates for any dependent variable (e.g. SO₂, NO_x, deforestation, etc.) peak at income levels, which are around the world's mean income per capita. Income as expected is not normally distributed but skewed (with a lot of countries below mean income per capita). Arrow *et al.* (1995), Ekins (1997) and Ansuategi *et al.* (1998) provide a number of reviews and critiques of the EKC studies. Stern *et al.* (1996) identified a number of problems with some of the main EKC estimators and their interpretation. They mention among other econometric problems, the mean-median income problems, the interpretation of particular EKCs in isolation from other environmental problems, the assumption of unidirectional causality from growth to environmental quality and the reversibility of environmental change and the asymptotic behaviour. Stern (1998) reviews these problems in detail and shows where progress has been made in empirical studies.

Cropper and Griffiths (1994) and Selten and Song (1994), conclude that the majority of countries in their analyses are below their estimated peak levels for air pollutants and thus economic growth may not reduce air pollution or deforestation. This implies that estimating the left part of EKC is easier than estimating the right hand part. Thus, use of OLS is not likely to yield accurate estimates of the peak levels.

The differences in the extracted relationships as well as in the estimated turning points may be attributed to the econometric models' functional form used and the adoption of static or dynamic analysis. Stern and Common (2001) find that sulfur emissions per capita are a monotonic function of income per capita, when they use a global sample and an inverted U-shape function of income when they use a sample of high-income countries only. They calculate a much larger in size turning point (\$ 908178) compared with the total sample, again implying a monotonic EKC. Halkos (2003), using the same database but proposing a dynamic model formulation finds much lower turning points in the range of \$2805-\$6230 and inverted U-shape curves.

At the same time the inclusion of other independent variables in the model formulation, affects significantly the estimated relationship. Roca *et al.* (2001) claim that estimated EKC is weaker when more explanatory variables are used together with income. Empirical evidence is not clear and mixed results have been found (Galeotti *et al.*, 2006; He and Richard, 2010; Chuku, 2011).

A number of studies found a linear and monotonic relationship between environmental damage and income per capita. Akbostanci *et al.* (2009) examined the income–environment relationship in the case of Turkey using time series and provincial panel data for the periods 1968-2003 and 1992-2001 respectively. They found a monotonically increasing relationship between carbon dioxide emissions and income in the case of times series analysis. Similarly, Fodha and Zaghoud (2010) found a monotonically increasing relationship between CO₂ emissions and GDP for Tunisia and for the period 1961-2004.

Other researchers have found an inverted-U shaped relationship with turning points ranging from \$823 to \$79,000, implying a possible separation of environmental damage from economic development (Grossman and Krueger, 1995; Holtz-Eakin and Selden 1995; Cole *et al.*, 1997; Stern and Common 2001; Halkos, 2003; Galeotti *et al.*, 2006). Fodha and Zaghoud (2010) found an inverted-U shaped relation with a turning point of \$1,200 for SO₂ for Tunisia and the period 1961-2004. Panayotou (1993; 1995; 1997) employed cross sectional data and GDP in nominal US \$ (1985). The equations for the pollutants considered were logarithmic quadratics in income per capita. Deforestation was estimated against a translog function in income/c and population density. All the curves estimated were inverted U's with turning point for deforestation at \$823 per capita. Finally, He and Richard (2010) using parametric, semi-parametric and non-linear models found weak evidence of the EKC hypothesis for the relationship between CO₂ emissions and GDP in the case of Canada and for the period 1948-2004.

Stern *et al.* (1996) claim that the mix of effluent has shifted from sulphur and NO_x to CO₂ and solid waste, in a way that aggregate waste is still high and even if per unit output waste has declined, per capita waste may not have declined. Regressing per capita energy consumption on income and temperature gave them an inverted U-shape relationship between energy and income. Energy consumption peaked at \$14600. The authors claim that the results depend on the income measure used. If income in PPP is used, the coefficient on squared income was positive but small and insignificant. If income per capita was measured using official exchange rates, the fitted energy income relationship was an inverted U-shape with energy use peaking at income \$23900.

Others have found an *N*-shape relationship (Friedl and Getzner, 2003; Martinez-Zarzoso and Bengochea-Maranchó, 2004) which shows that the release of environmental damage from economic development may be temporary (He and Richard, 2010). Grossman and Krueger's (1991, 1995) and Shafik and Bandyopadhyay (1992) suggest that at high-income levels, material use increases in a way that the EKC is *N*-shape. Friedl and Getzner (2003) found an *N*-shaped relationship between CO₂ and GDP for Australia and for the time period 1960-1999. Akbostanci *et al.* (2009) found an *N*-shaped relationship in the case of SO₂ and PM10 emissions in their panel data analysis.

3. Reasons justifying the EKC

A number of recent EKC studies consider the factors, which cause an inverted U-shape pattern. A first reason is the improvement in environmental quality as the result of the change in the technological mode of production (de Bruyn, 1997; Han and Chatterjee, 1997) or of the exportation of "dirty industry" to less developed or developing countries (Rock, 1996; Suri and Chapman, 1998; Heerink *et al.*, 2001; Lieb, 2003).

Another reason is the role of preferences and regulation on the emissions profile of polluters. In the formalization of the transition to the low-pollution state there is a group of authors that provide significant analyses of the role of preferences and regulations on the emissions profile of polluters (Lopez, 1994; McConnell, 1997; Stokey, 1998). The better institutional set up in the form of credible property rights, regulations and good governance may create public awareness against environmental degradation (Dinda *et al.*, 2000). They claim that technological improvements, structural economic change and transition and increase in spending on environmental R & D accompanied with increasing per capital income are important in determining the nature of the relationship between economic growth and environmental quality.

The levels of several pollutants per unit of output in specific processes have declined in the developed countries over time with the use of strict environmental regulations. Pollution will stop increasing and start to decrease with economic growth because some constraints will become non-binding (Lieb, 2003). Stokey (1998) shows that pollution increases linearly with income until the threshold is passed and cleaner technologies can be used. The implied pollution-income path may be an inverse-V with a sharp peak taking place at the point where a continuum of cleaner technologies becomes available. Jaeger (1998), similarly to Stokey, finds that the pollution income relationship is an inverted-V. Jaeger relies on the assumption that at low levels of pollution consumers' taste for clean air is satisfied and marginal benefit of additional environmental quality is zero. Similarly, Jones and Manuelli (1995) using an overlapping generations model and determining economic growth by pollution regulations and market interactions show that depending on the decision making institution the pollution-income relationship may have an inverted V shape, but it could also be monotonically increasing or a "sideways-mirrored S".

Andreoni and Levinson (2001) suggest another explanation due to the technological link between consumption of a desired good and abatement of its undesirable by products (pollution). Torras and Boyce (1998) argue that the greater equality of incomes results in lower level of environmental degradation. This claim is challenged by Scruggs (1998). Demand for environmental quality increases with income implying environmental quality is a normal good. Poor people have little demand for environmental quality but as society gets richer its members intensify their demands for a healthier and cleaner environment (Lieb, 2003).

Natural progression of economic development goes from clean agricultural to polluting industrial and to clean service economies. Specifically, economic development is associated with environmental pollution and there are three different effects that may explain this relationship. Namely, the scale effect, the composition effect and the technical effect (Grossman and Krueger,

1995; Dinda, 2004; Everett *et al.*, 2010). The scale effect has a negative influence as more output results in more adverse effects for the environment. Simply higher quantities of output demand more natural resources in the production processes and lead to more emissions and by-products leading to environmental damage. At the same time the composition effect may have a positive influence on the environment offsetting (even partially) the adverse effects. The idea is that as economic output increases the structure of the economy tends to shift from agricultural activity to industrial economy which is pollution-intensive and then to service economy which are less damaging the environment. Figure 1 shows the mentioned effects graphically.

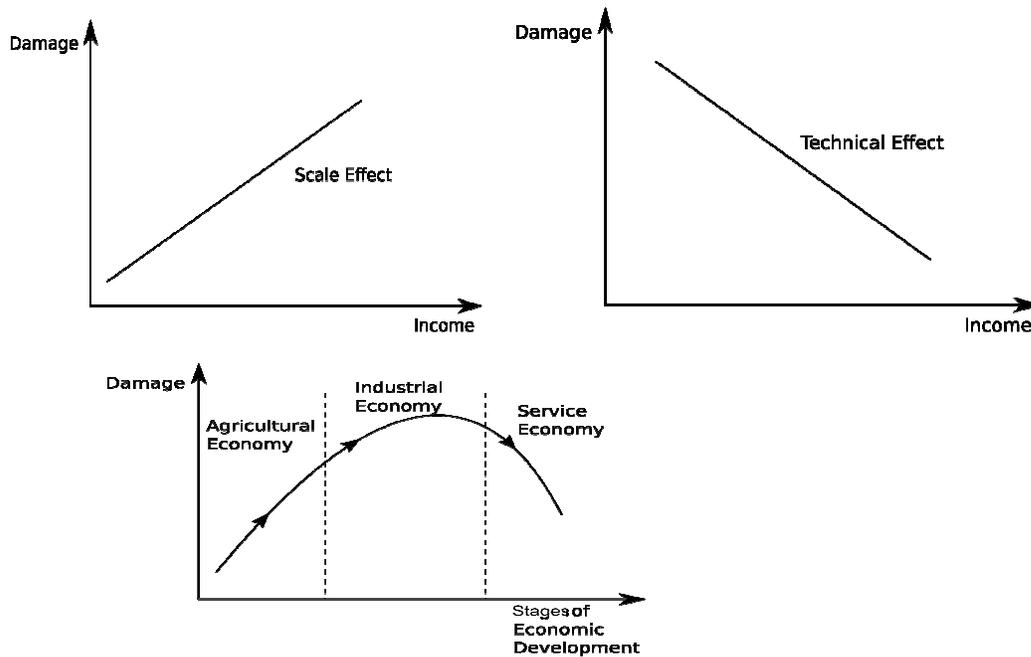


Figure 1: Scale, technical and composition effects

In analyzing long time-series, the three effects in continuation lead to an initial stage of economic development which has a negative effect on the environment due to scale effect followed up by changes in the structure of the economy as well as in the production methods that take place at the next stages of development which have positive effects on the environment and are due to composition and technical effects.

Similarly, environmental damage could enlarge through the scale effect as increasing volumes of exports increase the size of the economy. But trade can enrich environment through composition and/or technical effects. As income rises through trade, environmental regulation is becoming stricter encouraging pollution reducing innovations. According to Dinda (2004) the composition effect is attributed to two hypotheses. First *the displacement hypothesis* according to which the pollution intensive industries migrate from countries with stricter environmental standards to those with less strict standards. In this way rich countries are likely to be net importers of pollution intensive goods. The extracted inverted U-shape curve may be the result of changes in international specialization with that trade liberalization to lead to more pollution intensive industries in less developed economies as developed economies implement stronger environmental standards. Second *the pollution haven hypothesis* refers to the case where multinational firms (mainly involved in highly polluting activities) move to countries with less strict environmental regulations. This hypothesis states that low environmental regulations may be source of comparative advantage and may lead to changes in trade patterns (Dinda, 2004).

4. Econometric methods and Data used

The basic model to be estimated may be written as:

$$Y_{it} = \alpha + X_{it}\beta_i + \delta_i + \gamma_t + \varepsilon_{it} \quad (4.1)$$

where Y_{it} is the dependent variable; X_{it} is a k-vector of explanatory variables; and ε_{it} are the disturbance terms for $i = 1, 2, \dots, M$ cross-sectional units in periods $t = 1, 2, \dots, T$. The parameter α corresponds to the overall constant in the model while δ_i and γ_t represent cross-section and period specific effects (random or fixed) respectively.

Both fixed and random effects are inefficient in the presence of heteroskedasticity (Baltagi, 2001). In order to take into account heteroskedasticity and various patterns of correlation between the residuals, Generalized Least Squares (GLS) specifications may be used. For estimating β the GLS estimator is given as:

$$\hat{\beta} = (X'\Phi^{-1}X)^{-1}X'\Phi^{-1}Y \quad (4.2)$$

We have applied panel data methods to estimate the above equation. The first method employed is the fixed effects (hereafter FE), which allows each individual country to have a different intercept treating the α_i and γ_i as regression parameters. This practically implies that the means of each variable for each country are subtracted from the data for that country and the mean for all countries in the sample in each individual time period is also deducted from the observations from that period. Then Ordinary Least Squares is used to estimate the regression with the transformed data.

The second model is the random effects (hereafter RE) in which the individual effects are treated as random. In this model the α_i and γ_i are treated as components of the random disturbances. The residual from an OLS estimate of the model with a single intercept are used to construct variances utilized in a GLS estimates (for further details see Hsiao, 1986). If the effects α_i and γ_i are correlated with the explanatory variables then the random effects model cannot be estimated consistently (Hsiao, 1986, Mundlak, 1978).

The orthogonality test for the RE and the independent variables is also examined. For this reason, a Hausman test is used in order to test for inconsistency in the RE estimate. This test compares the slope parameters estimated for FE and RE models. A significant difference indicates that the RE model is estimated inconsistently due to correlation between the independent variables and the error components. If there are no other statistical problems the FE model can be estimated consistently although the estimated parameters are conditional on the country and time effects in the selected sample of data (Hsiao, 1986). In the case of coefficient heterogeneity FE and RE estimates in a static formulation are consistent in the absence of other misspecification (Stern, 2010).

In our case, we analyze CO₂/c emissions in a sample of 32 countries for the period 1971-2006. We have performed Box-Cox tests in order to test the linear against the logarithmic functional form of the relationship between CO₂/c and GDP/c. The model proposed here is estimated as:

$$(\text{CO}_2/\text{c})_{it} = \alpha_i + \gamma_t + \beta_1 (\text{GDP}/\text{c})_{it} + \beta_2 (\text{GDP}/\text{c})_{it}^2 + \beta_3 (\text{GDP}/\text{c})_{it}^3 + \varepsilon_{it} \quad (4.3)$$

where the α_i 's are country specific intercepts and the γ_t 's are time specific intercepts and the countries are indexed by i and time periods by t . CO₂/c is carbon dioxide emissions per capita in tons and ε_{it} is a disturbance term. Our sample consists of the 32 countries with full record on CO₂ and GDP per capita information for the period 1971-2006¹¹. The database used has 1152 observations per variable. GDP

¹¹ The countries used in our analysis are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, UK, USA, Brazil, Chile, China, India, Indonesia, Israel, Russia, South Africa.

per capita has been used in international prices (2005 US dollars) and the data have been obtained from OECD (2008). The CO₂ data have been obtained from the IEA (2010).

5. Empirical evidence

Table 1a presents the results of a number of unit root tests on the variables of interest (i.e. CO₂/c and GDP/c). From this table it can be seen that there is evidence against non-stationarity in levels. Specifically, in all cases and according to the tests adopted, our variables are I(1). That is, they are stationary in first differences and non-stationary in levels in all levels of statistical significance. Similarly Table 1b presents the Pedroni Cointegration Tests. In seven of the eleven cases we reject the null hypothesis of no cointegration at the conventional statistical significance level of 0.05.

Table 1a: Summary of panel unit root tests

Levels	Levin, Lin and Chu t*	Breitung t-stat	Im, Pesaran and Shin W-stat	ADF- Fiscer Chi square	PP- Fiscer chi-square
CO ₂ /c	-0.24013 [0.4051]	1.5615 [0.9408]	0.19409 [0.5769]	59.5051 [0.6360]	65.1873 [0.4352]
GDP/c	9.1413 [1.0000]	2.09624 [0.9820]	9.59097 [1.0000]	31.1598 [0.9998]	14.9650 [1.0000]
First Differences	Levin, Lin and Chu t*	Breitung t-stat	Im, Pesaran and Shin W-stat	ADF- Fiscer Chi square	PP- Fiscer chi-square
Δ CO ₂ /c	-9.06847 [0.0000]	-5.7905 [0.0000]	-13.7486 [0.0000]	304.282 [0.0000]	870.216 [0.0000]
Δ GDP/c	-4.51879 [0.0000]	0.37198 [0.6450]	-6.7141 [0.0000]	162.935 [0.0000]	314.352 [0.0000]

P-values in brackets

Table 1b: Pedroni Residual Cointegration Test

	Statistic	Prob.	Weighted Statistic	Prob
Panel v-Statistic	2.5056	0.0061	-0.5731	0.7170
Panel rho-Statistic	3.4835	0.9908	1.1007	0.8645
Panel PP-Statistic	-1.074	0.8585	-4.039	0.0000
Panel ADF-Statistic	-7.862	0.0000	-4.9215	0.0000
Group rho-Statistic	3.138	0.9991		
Group PP-Statistic	-3.1889	0.0007		
Group ADF-Statistic	-2.914	0.0018		

Next, Table 2 presents the panel data model results. Fixed and random effects were estimated first. These models were estimated also with time and country dummies but the results were insignificant. The diagnostic tests for the fixed and random effects models show a number of problems. As the Hausman test shows country intercepts and GDP/c are correlated in the global model. The test shows that the random effects formulation is consistently estimated. This suggests that there are omitted variables, which are correlated with GDP/c. Looking at the Breusch-Pagan Lagrange multiplier test for random effects we reject the null hypothesis in favor of the random effects model and we find significant differences across countries. Similarly, the Pesaran’s test of cross sectional independence leads to rejection of the null hypothesis and there is cross-sectional dependence implying the estimation of the Driskoll-Kraay standards errors. Finally the modified Wald test for group-wise heteroskedasticity led to rejection of homoskedasticity.

We have estimated a number of other panel data analysis methods. As we face problem of heteroskedasticity, generalized least squares were estimated with panel specific AR(1) as well as generalized least squares with common AR(1) coefficients for all panels and heteroskedastic panels in both cases. Between the two estimations, the latter performed better. The results are presented in the last column of Table 2. The model passes the diagnostic tests and indicates the presence of an N-shaped curve, and parameter estimates as well as t-statistics are all statistically significant. The turning

points are calculated at \$22175 and \$57231. Although the first is well within the sample the latter is above the maximum value of GDP/c in the sample (\$52152).

Table 2: Panel data model estimates

Model	FE	FE Driskoll-Kraay s.e.	RE	FGLS RE Common AR(1)
Constant	386.08 (12.243) [0.0000]	386.08 (4.30) [0.0000]	387.95 (2.3253) [0.0202]	177.115 (28.52) [0.0000]
GDP _c	0.02174 (2.997) [0.0028]	0.02174 (5.18) [0.0000]	0.0213 (2.943) [0.0033]	0.01793 (58.55) [0.0000]
GDP _c ²	-1.05E-06 (-2.7697) [0.0057]	-1.05E-06 (-4.72) [0.0000]	-1.03E-06 (-2.7224) [0.0066]	-5.61E-07 (-44.52) [0.0000]
GDP _c ³	1.78E-11 (3.0458) [0.0024]	1.78E-11 (4.30) [0.0000]	1.76E-11 (3.0091) [0.0027]	4.71E-12 (28.52) [0.0000]
Adjusted R ²	0.942	0.942		
Modified Wald test	64000 [0.0000]			
Pesaran test	9.292 [0.0000]			
Breusch-Pagan LM			17010.81 [0.0000]	
Hausman Test			0.74 (P=0.3884)	
Turning Point				22171 and 57235
Heteroskedasticity		1.77 [0.077]	1.47 [0.141]	0.110 [0.91]
Heteroskedasticity		9.76 [0.000]	1.87 [0.062]	0.22 [0.828]
RESET ₁		4.82 [0.0000]	4.88 [0.0000]	0.81 [0.418]
RESET ₂		13.39 [0.0000]	13.61 [0.0000]	0.35 [0.7021]

In the same table four more diagnostic tests are presented in the last four rows. The first two are tests for heteroskedasticity while the last two for specification errors. The first test is a regression of the squared residuals on Xs while the second test is essentially a Glejser test. In most cases but the last there is heteroskedasticity problem. The last two tests refer to the specification error and are applied by regressed the residuals on the squared fitted values and on the cubic fitted values. The results of these RESET tests imply that the equations of our model are not misspecified only in the last case.

Moreover, an individual (country) time series analysis has been performed in order to see how much the total extracted relationship (N-shape) represents individual countries. First all the variables of the countries considered were tested for stationarity and were all I(1). Table 3 shows that the picture is unclear. Greece shows N-shape behavior but at the same time South Africa, Australia and Finland show a monotonic relationship and Brazil an inverted U-shaped relationship. This raises the issue of heterogeneity as discussed analytically in Dijkgraaf and Vollebergh (2005).

Table 3: Individual time series analysis

Model	Greece	South Africa	Australia	Finland	Brazil
Constant	889.7 (26.98) [0.0000]	151.65 (14.03) [0.0000]	116.37 (39.65) [0.0000]	44.1323 (25.318) [0.0000]	31.94 (3.644) [0.0000]
GDP _c	0.0375 (5.261) [0.0000]	0.03812 (9.82) [0.0000]	0.0083 (53.28) [0.0000]	0.00058 (5.928) [0.0000]	0.1014 (11.83) [0.0000]
GDP _c ²	-2.75E-06 (-6.361) [0.0000]				-1.19E-05 (-7.7575) [0.0000]
GDP _c ³	4.72E-11 (6.067) [0.0000]				
Adjusted R ²	0.93	0.74	0.99	0.51	0.65
Normality	0.38784 [0.8237]	2.175 [0.3371]	0.2825 [0.8683]	0.3031 [0.8585]	1.667 [0.4347]
RESET	0.6573 [0.4175]	0.1557 [0.6931]	0.1956 [0.6583]	0.2531 [0.6363]	1.3579 [0.2439]
ARCH effect	0.131994 [0.7164]	0.2039 [0.9031]	2.0288 [0.1543]	1.999 [0.1617]	1.91292 [0.1516]
Turning Point	8822 and 19240				4261
Comments	N-shaped	Monotonic increase	Monotonic increase	Monotonic Increase	Inverted U- shaped EKC

Figures in parentheses are t statistics and in brackets P-values.

6. Conclusions and policy implications

Economic growth leads to higher pollution. This scale effect has several explanations. The demand for environmental quality is higher with higher income levels because of the potential damage irreversibility and higher demand for environmental quality requires stricter environmental regulations (Lieb, 2003). Our results indicate the existence of an N-shaped relationship between economic development and pollution in the form of CO₂ emissions as shown in Figure 2. The N-shape curve has the first turning point at \$22171 and the next at \$57235. The first is well within the sample while the second is outside the sample size maximum value (\$52156). This implies that the reduction of environmental damage from economic development may be temporary and CO₂ emissions will increase indefinitely above the income level of \$57235.

We also find that the turning points calculated by panel data analysis may not reveal the actual turning points (if any) that arise for individual countries. In our case and using different countries from different geographical regions we found a mixture of monotonic, or inverted U-shape or N-shape behavior. This implies that the adaptation of the total N-shape income-environment relationship may be misleading with serious policy ineffectiveness implications.

Lieb (2003) claims that the downturn part of the N-shape may be due to a shock while the upturn part due to an equilibrium relationship. Lieb presents a thoughtful explanation for the final upturn of the extracted N-shape curve. This may be justified by the completion of the internalization of the pollution externality as well as that the abatement opportunities are exhausted. Lieb also claims that there is lower thermodynamics bound on material and energy use per unit of GDP as well as that at higher incomes the control methods applied exhibit decreasing and not anymore increasing returns to scale.

A number of policies may be followed. The need for technology transfer to help developing countries to achieve sustainability emerges. To reduce pollution levels many developed countries expect technology transfers in the form of foreign direct investment from developed countries. These clean and updated technologies will reduce environment damage by controlling emission levels. The main idea is that abatement technologies in developed countries are cleaner and more advanced. As developing countries have no financial resources to import and use these technologies at commercial cost this implies that developed countries should transfer or facilitate the transfer of these technologies

to less develop or developing countries. The impact of this technology transfer depends on the type of industrial activity. That is, in the energy sector these transfers will be more beneficial for the environment compared to other industries such as textiles, etc. It should be emphasized that transfer of information must accompany these technology transfers on know-how and skills to enable countries to design or modify their own technologies.

Environmental policy may be a significant initiative for innovation. As air pollution is considered an externality, internalization of this externality requires relatively advanced institutions for collective decision making. This can be achieved only in developed economies. Stefanescu et al. (2008) showed that there is a series of opportunities associated with technological, human and economic reengineering technological processes for an efficient development. Barbu (2010) cites that a number of scientists think that nowadays crisis will make people use less energy and in this way to limit carbon emissions as the global crisis leads to less purchasing power implying less natural resources use for industrial and manufacturing activities. Hopefully people will keep concentrated in the protecting the environment and will not prioritize the economy.

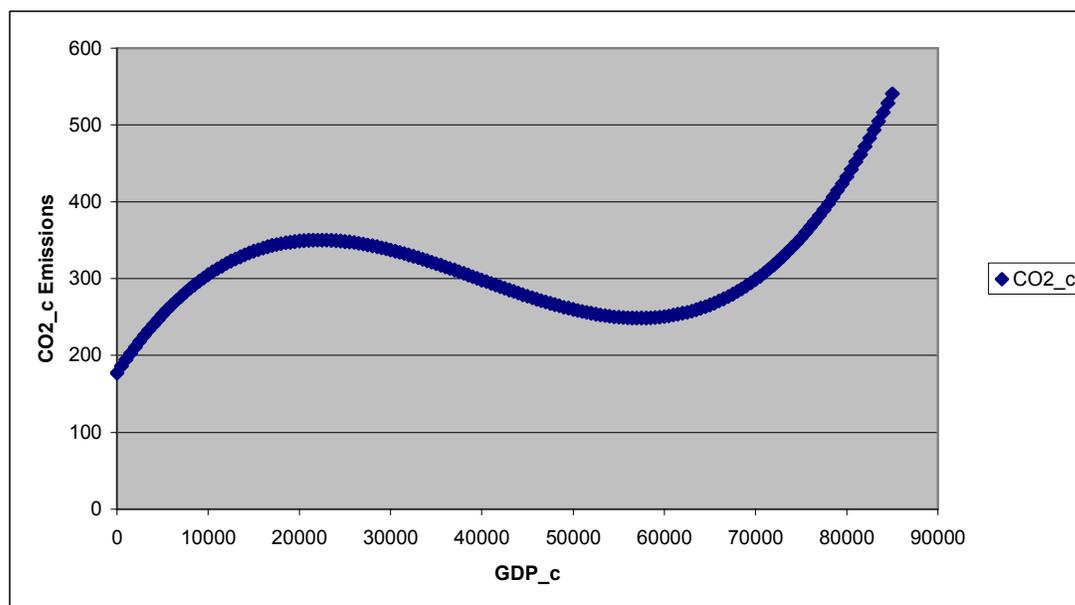


Figure 2: The extracted N-shape curve for the sampled countries

References

- [1] Akbostanci, E., Turut-Asik, S., and Tunc, G. I., (2009). The relationship between income and environment in Turkey: is there an environmental Kuznets curve, *Energy Policy*, 37: 861-867.
- [2] Andreoni J. and Levinson A., (2001). The simple analytics of the environmental Kuznets curve, *Journal of Public Economics*, 80: 269-286.
- [3] Ansuategi A., Barbier E.B. and Perrings C.A., (1998). The Environmental Kuznets Curve, in: Van den Bergh, J.C.J.M. and Hofkes, M.W. (Eds) *Theory and Implementation of Economic Models for Sustainable Development*, Kluwer.
- [4] Arrow K., Bolin B., Costanza R., Dasgupta P., Folke C., Holling C.S., Jansson B-O, Levin S., Maler K-G, Perrings C. and Pimentel D., (1995). Economic growth, carrying capacity and the environment, *Science*, 268: 520-521.
- [5] Baltagi, B. H., (2001). *Economic analysis of panel data*, (2nd ed.). New York: Wiley.
- [6] Barbu C., (2010). Does the economic crisis affect Oltenia's environment?, *Journal of Applied Economic Sciences*, 1(11): 23-29.
- [7] Chuku A., (2011). *Economic development and environmental quality in Nigeria: is there an*

- environmental Kuznets curve?*, MPRA Paper 30195, University Library of Munich, Germany.
- [8] Cole, M.A., and Elliot, R.J.R. (2003). Determining the trade-environment composition effect: the role of capital, labour and environmental regulations, *Journal of Environmental Economics and Management*, 46 (3): 363-383.
- [9] Cropper M. and Griffiths C., (1994). The interaction of pollution growth and environmental quality, *American Economic Review*, 84(2): 250-254.
- [10] De Bruyn, S.M., van den Bergh, J.C.J.M., and Opschoor, J.B., (1998). Economic growth and emissions: reconsidering the empirical basis of Environmental Kuznets Curves, *Ecological Economics*, 25: 161-175.
- [11] Dijkgraaf, E., and Vollebergh, H.R.J., (2005). A test for parameter homogeneity in CO₂ panel EKC estimates, *Environmental and Resource Economics*, 32: 229-239.
- [12] Dinda S., D. Coondos and Pal M., (2000). Air quality and economic growth: an empirical study, *Ecological Economics*, 34: 409-423.
- [13] Dinda, S., (2004). Environmental Kuznets curve hypothesis: A survey, *Ecological Economics*, 49: 431-455.
- [14] Ekins P., (1997). The Kuznets curve for the environment and economic growth: examining the evidence, *Environment and Planning*, 29: 805-830.
- [15] Everett T., Ishwaran M, Ansaloni GP and Rubin A., (2010). *Economic growth and the environment*, MPRA Paper 23585, University Library of Munich, Germany.
- [16] Fodha, M., and Zaghdoud, O., (2010). Economic growth and pollution emissions in Tunisia: An empirical analysis of the environmental Kuznets curve, *Energy Policy*, 38: 1150-1156.
- [17] Friedl, B., and Getzner, M., (2003). Determinants of CO₂ emissions in a small open economy, *Ecological Economics*, 45: 133-148.
- [18] Galeotti, M., Lanza, A., and Pauli, F., (2006). Reassessing the environmental Kuznets curve for CO₂ emissions: a robustness exercise, *Ecological economics*, 57: 152-163.
- [19] Grossman G. and Krueger A., (1991). *Environmental impacts of a North American Free Trade Agreement*, NBER Working Paper 3914, National Bureau of Economic Research, Cambridge MA.
- [20] Grossman G. and Krueger A., (1995). Economic growth and the Environment, *Quarterly Journal of Economics* 110: 353-377.
- [21] Halkos G.E., (2003). Environmental Kuznets Curve for sulphur: Evidence using GMM estimation, forthcoming in: *Environment and Development Economics*.
- [22] Han X., and Chatterjee L., (1997). Impacts of growth and structural change on CO₂ emissions of developing countries, *World Development*, 25: 395-407.
- [23] He J., and Richard P., (2010). Environmental Kuznets curve for Co₂ in Canada, *Ecological Economics*, 69: 1083-1093.
- [24] Heerink, N., Mulatu A. and Bulte E., (2001). Income inequality and the environment: aggregation bias in environmental Kuznets curves, *Ecological Economics*, 38: 359-367.
- [25] Holtz-Eakin, D., and Selden, T.M., (1995). Stoking the fires: CO₂ emissions and economic growth, *Journal of Public Economics*, 57: 85-101.
- [26] Hsiao C., (1986). *Analysis of panel data*, Cambridge University Press, Cambridge UK.
- [27] IEA, (2010). CO₂ Emissions from Fuel Combustion – Highlights 2010, International Energy Agency. <http://www.iea.org/co2highlights>
- [28] Jaeger W., *A theoretical basis for the environmental inverted-U curve and implications for international trade*, Williams College, Working Paper, 1998

- [29] Jones, L.E., Manuelli, R.E., 1995. A Positive Model of Growth and Pollution Controls. NBER Working Paper No. 5205.
- [30] Kuznets, S., (1955). Economic growth and income inequality, *American Economic Review*, 58: 231-244.
- [31] Lieb C.M., (2003). *The Environmental Kuznets Curve: A survey of the empirical evidence and the possible causes*. University of Heidelberg Department of Economics, Discussion Paper Series No 391.
- [32] Lopez R., (1994). The environment as a factor of production: the effects of economic growth and trade liberalization, *Journal of Environmental Economics and Management*, 27: 163-184.
- [33] Martínez-Zarzoso I. and Bengochea-Morancho A., (2004). Pooled mean group estimation of an environmental Kuznets curve for CO₂, *Economics Letters*, 82(1): 121-126.
- [34] McConnell K.E., (1997). Income and demand for environmental quality', *Environment and Development Economics*, 2: 383-399.
- [35] Mundlak Y., (1978). On the pooling of time series and cross section data, *Econometrica*, 46: 69-85.
- [36] OECD, (2008). *National Accounts of OECD Countries*, OECD, Paris.
- [37] Panayotou T., (1993). *Empirical tests and policy analysis of environmental degradation at different stages of economic development*, Working Paper WP238, Technology and Employment Programme, International Labor Office, Geneva.
- [38] Panayotou T., (1995). Environmental degradation at different stages of economic development, in: I. Ahmed and J. A. Doeleman (eds.) *Beyond Rio: The Environmental Crisis and Sustainable Livelihoods in the Third World*, MacMillan, London.
- [39] Panayotou, T., (1997). Demystifying the environmental Kuznets curve: turning a black box into a policy tool, *Environment and Development Economics*, 2(4): 465-484.
- [40] Selten, T. and D. Song, (1994). Environmental quality and development: is there a Kuznets curve for air pollution emissions? *Journal of Environmental Economics and Management*, 27:147-162.
- [41] Roca, J., Padilla, E., Farre, M., Galletto, V., (2001). Economic growth and atmospheric pollution in Spain: discussing the environmental Kuznets hypothesis, *Ecological Economics*, 39: 85-99.
- [42] Rock M.T., (1996). Pollution intensity of GDP and trade policy: can the World Bank be wrong?, *World Development*, 24: 471-479.
- [43] Scruggs L.A., (1998). Political and economic inequality and the environment, *Ecological Economics*, 26: 259-275.
- [44] Shafik, N. and Bandyopadhyay S., (1992). *Economic growth and environmental quality: time series and cross-country evidence*, Background paper for the World Development Report 1992, The World Bank, Washington DC.
- [45] Stefanescu L., Ungureanu L. and Matei I.V., (2008). Reengineering as an Efficient Solution to Redesign Activities and Processes of an Enterprise, *Journal of Applied Economic Sciences*, 3(2(4)): 84-89.
- [46] Stern D. I., Common M.S., and Barbier E.B., (1996). Economic growth and the environmental degradation: the environmental Kuznets Curve and sustainable development, *World Development* 24: 1151-1160.
- [47] Stern D.I., (1998). Progress on the environmental Kuznets curve?, *Environment and Development* 3: 175-198.
- [48] Stern, D. I. and Common M.S., (2001). Is there an environmental Kuznets curve for sulphur?, *Journal of Environmental Economics and Management*, 41: 162-178.

- [49] Stern D.I., (2010). *Between estimates of the Environmental Kuznets Curve*, Centre for Applied Macroeconomic Analysis, The Australian National University CAMA Working Paper 4/2010.
- [50] Stokey N.L., (1998). Are there limits to growth?, *International Economic Review*, 39: 1-31.
- [51] Suri V. and Chapman D., (1998). Economic growth, trade and energy: implications for the environmental Kuznets curve, *Ecological Economics*, 25: 195-208.
- [52] Torras M. and Boyce J.K., (1998). Income, inequality and pollution: a reassessment of the environmental Kuznets curve, *Ecological Economics*, 25:147-160.

A WIN-WIN MONETARY POLICY IN CANADA

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Abstract

The Lucas critique has exposed the problem of the trade-off between changes in monetary policy and structural breaks in economic time series. The search for and characterization of such breaks has been a major econometric task ever since. We have developed an integral technique similar to CUSUM using an empirical model quantitatively linking the rate of inflation and unemployment to the change in the level of labour force in Canada. Inherently, our model belongs to the class of Phillips curve models, and the link between the involved variables is a linear one with all coefficients of individual and generalized models obtained by empirical calibration. To achieve the best LSQ fit between measured and predicted time series cumulative curves are used as a simplified version of the 1-D boundary elements (integral) method. The distance between the cumulative curves (in L^2 metrics) is very sensitive to structural breaks since it accumulates true differences and suppresses uncorrelated noise and systematic errors. Our previous model of inflation and unemployment in Canada is enhanced by the introduction of structural breaks and is validated by new data in the past and future. The most exiting finding is that the introduction of inflation targeting as a new monetary policy in 1991 resulted in a structural break manifested in a lowered rate of price inflation accompanied by a substantial fall in the rate of unemployment. Therefore, the new monetary policy in Canada is a win-win one.

Keywords: structural break, inflation, unemployment, labor force, modeling, Canada

JEL classification: E3, E6, J21

1. Introduction

The Bank of Canada was one of the first worldwide to announce the policy of inflation targeting between 1 and 3 percentage points per year (Bank of Canada 2010). This objective was originally articulated in 1988 and this new monetary policy was formally introduced in 1991. The goal to retain the level of price inflation in the designated range may introduce a measurable disturbance in a given economy and affect the links between major macroeconomic variables, as was explicitly indicated by Lucas (1976). Then, the basis of price inflation targeting might be corrupted since inflation sensitivity to other macroeconomic variables may change. In this case, one would have observed “structural breaks” in the relationships between such macroeconomic time series as inflation and unemployment (or some other measures of economic activity), i.e. sudden changes in the related empirically derived coefficients (Hostland 1995).

In this paper, we quantitatively estimate and statistically characterize the evolution of several deterministic relationships between inflation and unemployment in Canada. One of our major objectives is to reveal and better estimate in time and amplitude the structural break potentially associated with the introduction of inflation targeting. For this purpose, we have adapted from physics and engineering the method of boundary elements in its simplified form of cumulative curves, which is complementary to the econometric techniques based on dynamic and differentiated time series. In some cases, the dynamic approach is subject to type I spurious regression damaging the estimation of actual links between time series (Chiarella, and Gao 2002).

Having estimated with the 1D boundary elements method a number of statistically reliable deterministic models of inflation and unemployment (Kitov, and Kitov 2010) we are able to find the trade-off between these variables, which may be best expressed in cumulative values (integrals). Page (1954) introduced a technique for univariate time series, which comprises the statistical basis for our empirical approach. This is a well-known CUSUM (cumulative sum) control chart. We use essentially bivariate and trivariate deterministic model with nonstationary time series and have to calibrate the model together with testing for structural breaks. Therefore, it is instructive to plot both (measured and predicted) times series instead of their demeaned difference. However, all statistical inferences related

to the CUSUM method can be applied one-to-one to the model residual.

Any structural break is (by definition) accompanied by the change in relevant model coefficients. When both sides of a given bivariate relationship are integrated over time the structural break must manifest itself in the divergence of integrals starting from the break point. Statistically, this approach is potentially a more reliable one than those based on specific features of dynamic time series. Firstly, all uncorrelated noise is suppressed by destructive interference. Secondly, any amplitude dependent systematic error is compensated by a proportional shift in the slope and all amplitude independent systematic errors add up to the free term. It is worth noting that nobody is able to measure true values of such macroeconomic variables as inflation and unemployment; they both depend on definitions which are never perfect. Hence, one always has systematic errors in these time series, which are not easy to handle in the dynamic representation since they may introduce an amplitude-dependent bias. Thirdly, the effect of the change in coefficients is steadily amplified (accumulated) by constructive interference with increasing signal to noise ratio. This effect is crucial for statistical inferences. Literally, the integral curves representing both sides of the equation diverge at a constant rate after the year of structural break.

For our model, all three benefits are working together. An additional (but not uncommon for econometrics) benefit consists in the fact that the cumulative sums of price inflation and the change rate of labor force are represented by actually measured overall price and labor force. Since the accuracy of price and labor force measurements is relatively high and approximately time independent the cumulative error terms in the time series of inflation and the change rate of labor force must always add up to the level of the measurement accuracy, i.e. asymptotically converge to a zero mean. This is a strong constraint on the error term in standard statistical inferences. In reality, all past values of labor force and prices are routinely revised with every new measurement to match the newly measured value.

However, all these benefits are conditional on the presence of a deterministic link. When a purely statistical link between two stochastic variables is integrated, the uncorrelated error term creates a stochastic trend, the systematic error correlates with the stochastic trend and cannot be separated from it, and the divergence between the integral curves after the break is not a quasi-linear one. This is the reason why econometricians do not use CUSUM. There is a slight prejudice against deterministic links in econometrics.

Fortunately, a variety of actual measurements reported by developed countries allow distinguishing between deterministic and stochastic links (Kitov 2007a; Kitov, and Kitov 2010). It was found and proved by strict and extensive statistical and econometric tests (Kitov, Kitov, and Dolinskaya 2007) that the evolution of price inflation and the rate of unemployment is driven by the change in the level of labor force. For Canada, we estimated these links several years ago (Kitov 2007b), without structural breaks however. Thus, we can validate the previous models using new data and refine them allowing for structural breaks.

Several years ago we introduced a concept linking by linear and lagged relationships price inflation and unemployment in developed countries to the change rate of labor force (Kitov 2006). Corresponding model is a completely deterministic one with the change in labor force being the only driving force causing all variations in the pair unemployment/inflation. Since 2006, many empirically estimated models have been tested econometrically (conditional on the length of time series) and the presence of cointegrating relations has been demonstrated. Formally, our model is a somewhat degenerate version and a marginal extension of such economic/econometric models as the conventional Phillips curve or the new Keynesian Phillips curve. For example, among the diversity of economic/financial variables used by Stock, and Watson (2003, 2008) as predictors of inflation, the set included approximately 200 time series, the change in labor force was absent. Thus, it was instructive to extend this set with labor force and to conduct a similar statistical investigation.

We have revealed for many developed countries (the USA, Japan, France and Germany among others) that, in purely econometric terms, this rather countable than measurable macroeconomic predictor is characterized by an extraordinary (relative to other tested parameters) power and inflation is not “hard to forecast”, as concluded by Stock, and Watson (2007). The change in labor force in the biggest developed economies is so good a predictor that there is no need to use autoregressive properties of inflation and other variables. In this sense, our model is fully deterministic and the model

residuals are related to measurement errors not to stochastic properties of the involved processes.

Here we have to notice that such an extensive usage of autocorrelation in the modeled time series implies that the researcher does not expect any other macroeconomic variables to be involved. Mathematically, it is a flawed way of quantitative analysis – autocorrelation terms severely mask any real driving force since the modeled time series is decomposed into a set of non-orthogonal functions (variables). The long history of econometric research has unambiguously demonstrated that the AR and similar statistical models are able to describe observations only superficially and suppress the signals from actual sources of inflation. Even with wrong predictors, the Phillips curve approach works best when inflation changes very fast and autocorrelation is highly deteriorated, as was observed between 1974 and 1994 in the U.S. (Stock, and Watson 2008). Then real forces reveal themselves: the change in labor force explains 80 to 90 per cent of the variability in the rate of inflation, with no AR terms.

The remainder of the paper is organized in four sections. Section 1 formally introduces the model as obtained and statistically tested in previous studies and highlights its major features different from those in the extensive literature on inflation and unemployment. This Section also presents and statistically characterizes various estimates of inflation, unemployment and labor force in Canada.

In Section 2, the linear link between labor force and unemployment is modeled using annual measurements of both variables. Instead of poorly constrained linear regression methods we apply a simplified version of the 1-D boundary element method – cumulative curves with the *LSQ* minimization. The integral approach allows distinguishing a structural break near 1990 when the predicted and observed curves start to diverge. In order to retain the convergence between the curves intact after 1990, the model coefficients are changed to minimize the *LSQ* residual. Section 3 is devoted to the link between the rate of inflation and labor force. We also use the method of cumulative curves in order to estimate all empirical coefficients and the year of structural break.

Finally, Section 4 presents the generalized link between inflation, unemployment and labor force which is characterized by the absence of any structural breaks. The best fit model provides an accurate prediction of inflation as a function of labor force and unemployment without changing coefficients.

2. The model and data

In its original form, the model was revealed and formulated for the United States (Kitov 2006). The root-mean-square forecast error (RMSFE) of inflation at a 2.5 year horizon was of 0.8% between 1965 and 2004. Thus, our model outperforms by a large margin any other economic and/or financial model of inflation; at least those presented by Stock, and Watson (2008). Well-known non-stationary behavior of all involved variables required testing for the presence of cointegrating relations (Kitov, Kitov, and Dolinskaya 2007). Both, the Engle-Granger, and Johansen approaches have shown the existence of cointegration between unemployment, inflation and the change in labor force, i.e. the presence of long-term equilibrium (in other words, deterministic or causal) relations. Because the change in labor force is likely a process with a strong stochastic component and it drives the other two variables (with significant lags) they also can exhibit formal features of the underlying stochastic process, at the same time being fully deterministic ones.

Here, we generally follow the original concept introduced by A.W. Phillips (1958) but suppose that price inflation and the rate of unemployment in a given developed country have to share the same driving force, and thus, there is a trade-off between them. Mathematically, inflation and unemployment are both linear and potentially lagged functions of the change rate of labour force:

$$\pi_t = a_1 l_{t-i} + a_2 \tag{1}$$

$$u_t = b_1 l_{t-j} + b_2 \tag{2}$$

where π_t is the rate of price inflation at (discrete) time t , as represented by some standard measure such as the GDP deflator (DGDP) or consumer price index (CPI); u_t is the rate of unemployment at time t , which also may have varying definition and measuring procedures; $l_t = d \ln LF(t) / dt$ is the log approximation to the growth rate of the level of labor force at time t , $LF(t)$; i and j are the (not negative) time lags; a_1 , b_1 , a_2 , and b_2 are country specific coefficients, which have to

be determined empirically in calibration procedures. There is no error term in (1) and (2) since the left- and right-hand sides must converge for a deterministic relationship by definition, with the error term fully related to measurement errors and its cumulative sum having a zero mean asymptote. Free term a_2 in (1) might replace the notion of “intrinsic inflation persistence” (Benati 2009). The rate of inflation with zero driving force ($l_t=0$) is constant, but this rate is not necessarily a policy independent one. The same statement is valid for b_2 - it is the rate of unemployment in the absence of any change in labor force.

All coefficients in (1) and (2) are subject to variations through time for a given country. The major source of such variations is numerous revisions to definitions and measurement methodologies of the studied variables, i.e. variations in measurement units. For example, the change of employment definition from n hours per week to m hours, where $n \gg m$, must induce a tangible change in the number of employed, and thus, in the rate of unemployment. Since only units of measurements are changed, i.e. the portion of the true value, the corresponding shift in coefficients in (1) and (2) is an artificial structural break, like mile to kilometer conversion. The introduction of monetary policy aimed at strong suppression of money supply, as implemented by the French central bank, is also able to change all coefficients (Kitov 2007). This is an example of an actual structural break associated with monetary policy, in sense of Lucas. We are looking for actual structural breaks in Canada, and thus, have to be very careful with data incompatibility over time.

Linear relationships (1) and (2) define inflation and unemployment separately. These variables are two indivisible manifestations or consequences of a unique process, however. The process is the growth in labor force which is accommodated in developed economies (we do not include developing and emergent economies in this analysis because they are likely not self-consistent) through two channels and results in the trade-off between inflation and unemployment, as was empirically revealed by A.W. Phillips. The original Phillips curve concept strictly implies that $i \geq j$, i.e. the change in unemployment drives inflation.

Considering the qualitative assumptions behind the quantitative model (1) and (2) we have revealed two processes which accommodate the endogenous (inflow of 16-year-olds and the age-dependent rate of death and labor force participation) or exogenous (international migration) change in labor force. The first process is the increase in employment and corresponding change in personal income distribution (PID). Since the rate of participation in labor is completely defined by real economic growth (Kitov, and Kitov 2008) the increase in employment does not depend on inflation and unemployment. Thus, real economic growth involves new persons who obtain new paid jobs or their equivalents and presumably change their incomes to some higher levels. Interestingly, a higher growth rate of real GDP in the U.S. causes a fall in the rate of participation in labor force two years later. This is a counterintuitive observation.

These newcomers do not change the relative distribution of incomes, however. There is a well-established empirical fact that the PID shape in the U.S. does not change with time in relative terms, i.e. when normalized to total population and total income. Therefore, the increasing number of people at higher income levels, as related to the new paid jobs, must be accompanied by a certain disturbance in the nominal PID. (This process is opposite to that behind the original Phillips curve, where the general trade-off between inflation and unemployment is not strictly constrained). This over-concentration (or “over-pressure”) of working population in some income bins above its “neutral” long-term value must be compensated by such an extension in corresponding income scale, which returns the PID to its original density. The related income scale stretch (money supply) is the core monetary process behind price inflation. In other words, the U.S. economy needs exactly the amount of money, extra to that related to real GDP growth, to pull back the PID to its fixed shape. The mechanism responsible for the compensation and the income scale stretching may have some positive relaxation time, which effectively separates in time the source of inflation (i.e. the labor force change) and the reaction - the growth in the overall price level.

The second process involves those persons in the labor force who wanted but failed to obtain a new paid job. These people do not leave the labor force and raise the rate of unemployment. Supposedly, they do not change the PID shape because they do not increase their incomes. Therefore, the total labor force change equals the unemployment change plus the employment change, the latter process expressed through lagged price inflation.

In the case of a "natural" or stationary behavior of the economic system, which is defined as a stable balance of socio-economic forces in the society, the partition of labor force growth between unemployment and inflation is retained through time and the linear relationships hold separately. There is always a possibility, however, to fix one of these two dependent variables. Central banks are definitely able to influence inflation rate by monetary means, i.e. to force money supply to change relative to its natural demand. To account for this effect one has to use a generalized relationship as represented by the sum of (1) and (2):

$$\pi_t + u_t = a_1 l_{t-i} + b_1 l_{t-j} + a_2 + b_2 \quad (3)$$

Equation (3) balances the change in labor force to inflation and unemployment; the latter two variables may lag by different times. When $i \neq j$, we cannot relate inflation and unemployment for the same year. Theoretically, equation (3) overcomes the Lucas critique – no monetary policy should be able to change the generalized relation between these three macroeconomic variables. The change in inflation is compensated by a proportional change in unemployment, with some time lag, which also can be negative. In practical terms, the importance of (3) is derived from the increasing number of successful prediction of inflation and unemployment in developed countries (Kitov, and Kitov 2010). One can rewrite (3) in a form similar to that of the Phillips curve:

$$\pi_t = c_1 l_{t-i} + c_2 u_{t+j-i} + c_3 \quad (4)$$

where coefficients c_1 , c_2 , and c_3 might be better determined empirically despite they can be directly obtained from (3) by simple algebraic transformation. The change in labor force is always the measure of economic activity instead of output gap and marginal labor cost.

When $i > j$, the rate of unemployment mimics the term associated with rational or not fully rational inflation expectations. In any case, the menu cost, distribution of price setting power, nominal rigidities, sticky prices and information and other components of the New Keynesian Phillips curve might have a simple functional form under our framework. Our model puts a strict constraint on the aggregate value of any parameter used under the NKPC framework. In that sense, we do not see any contradiction between our deterministic model and the variety of NKPC models. This is an issue for further theoretical investigations, however.

The principal source of information is the OECD database (<http://www.oecd.org>) which provides comprehensive data sets on labor force, unemployment, the GDP deflator, and CPI. We also use select estimates reported by the U.S. Bureau of Labor Statistic (<http://www.bls.gov>) for corroboration of the data on CPI, unemployment and labor force. As a rule, readings associated with the same variable but obtained from different sources do not coincide. This is due to different approaches and definitions applied by statistical agencies. The discrepancy between various estimates of the same variable is often associated with data incompatibility. When two estimates suddenly diverge or start to coincide it is possible to suggest that one of the agencies has adapted a new definition. The diversity of definitions is accompanied by a large degree of uncertainty related to the methodology of measurements. In many cases, this uncertainty cannot be directly estimated but certainly affects the reliability of empirical relationships.

Since there is no full compatibility in definitions and measurement procedures over time all data provided by all statistical agencies have to be checked for artificial breaks. It is crucial to distinguish between these breaks in measuring units and actual shifts in the relationships between the modeled variables. For Canada, the OECD (2008) reports the following:

Series breaks: In January 1976 the following revisions to the labor force survey were implemented: sample increase, from 35 000 to approximately 56 000 households; update of the sample by redesign; introduction of new methodology and procedures at the level of stratification, sample allocation and formation of sampling units; improvement of data collection techniques, quality control and evaluation procedures. Prior to 1966, the survey covers population aged 14 years and over.

Taking into account that the Statistics Canada has been reporting the labor force related time series since 1976, one can expect artificial breaks in corresponding variables in 1966, 1976, and 1990. There were several potentially influential revisions to the Labor Force Survey prior to 2000 (e.g.

1996, and 2000), as described by the Statistics Canada (2011). One has to bear them in mind when searching for structural breaks. In general, any deterministic model linking the originally reported estimates of labor force to inflation and unemployment would experience significant difficulties which can be resolved only by the appropriate shift in empirical coefficients in the break years. One cannot exclude other influential revisions after 2000.

Figure 1 displays the evolution of two principal measures of price inflation – the GDP deflator, *DGDP*, and consumer price index, *CPI*. Both variables were published by the OECD. We presume the *DGDP* as a better representative of price inflation in a given country since it includes all prices related to the economy. The overall consumer price index is fully included in the *DGDP* and its behavior is usually more volatile as representing only a (larger part) of the economy. Since labour force and unemployment do characterize the entire economy it is methodically correct to use the price deflator for quantitative modeling. Figure 1 shows that the difference between the *CPI* and *DGDP* estimates can reach several percentage points and their major peaks are not proportional in amplitude, e.g. 1974, 1982 and 1992. However, there are periods of coherency.

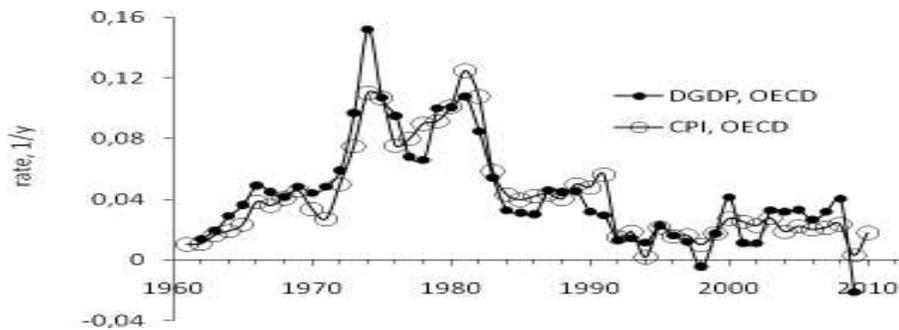


Figure 1. Price inflation: comparison of *CPI* and the *GDP* deflator in Canada, both reported by the OECD.

For the period between 1962 and 2009 (48 readings) the mean rate of *CPI* inflation is $0.043y^{-1}$ (± 0.031) and $0.044y^{-1}$ (± 0.033) for the *GDP* deflator. Thus, the *DGDP* in Canada is characterized by a higher volatility as associated with the peak in 1974. The rate of inflation fell to the level of $0.04y^{-1}$ in the beginning of 1980s and then to $0.02y^{-1}$ in 1991, i.e. after the introduction of inflation targeting. It has been oscillating around this level since. Between 1974 and 1983, inflation was almost everywhere above 6% per year.

Any macroeconomic variable is subject to measurement uncertainty and bias. Rossiter (2005) has considered the bias in the Canadian *CPI* by examining four different potential sources: commodity substitution bias, outlet substitution bias, quality change bias, and new goods bias. He found that the total measurement bias has increased only slightly in recent years to 0.6 percentage points per year ($0.006y^{-1}$), and is low when compared with other countries.

In order to establish a reliable link with the labor force, one needs to estimate basic statistical properties of relevant time series. The order of integration can be determined using unit root tests applied to the original series and their progressive differences. As a rule, the rate of inflation in developed countries is an $I(1)$ variable. Canada is not an exception, as Table 1 clearly demonstrates. In particular, we report the results of the following tests: the augmented Dickey-Fuller (ADF), the DF-GLS, and the Phillips-Perron (PP) test. The *DGDP* series consists of 48 readings (between 1962 and 2009) and the *CPI* series has 50 readings, both definitely have a unit root. The first differences ($dDGDP$ and $dCPI$) are characterized by the absence of unit roots, and thus, the original time series is integrated of order 1. For the period between 1963 and 2009, the naive predictions of inflation at a one-year horizon have the standard deviations of $0.020y^{-1}$ and $0.016y^{-1}$, respectively.

Table 1. Results of unit root tests for the original time series and their first differences.

	ADF	DF-GLS lag=2	z(ρ)	PP z(t)
CPI	-1.63 (-3.59)	-1.56 (-3.77)	-6.13 (-18.76)	-1.72 (-3.59)
dCPI	-5.61* (-3.61)	-4.79* (..)	-34.84* (-18.63)	-5.51* (-3.61)
DGDP	-1.76 (-3.60)	-1.76 (..)	-7.69 (-18.70)	-1.80 (-3.60)
dDGDP	-5.49* (-3.61)	-3.77 (..)	-36.62* (-18.63)	-5.26* (-3.61)
UE	-1.59 (-3.59)	-1.55 (..)	-6.18 (-18.76)	-1.77 (-3.59)
dUE	-5.07* (-3.61)	-3.97* (..)	-32.91* (-18.63)	-4.94* (-3.61)
dLF/LF	-2.71 (-3.59)	-1.87 (..)	-12.76 (-18.76)	-2.64 (-3.59)
d(dLF/LF)	-9.32* (-3.59)	-4.37*(..)	-58.41* (-18.76)	-9.69* (-3.59)

Figure 2 depicts two estimates of the rate of unemployment as reported by the OECD and the U.S. BLS. Surprisingly, the difference between these curves is almost negligible, but clearly demonstrates two artificial breaks in 1966 and 1976. There are two sharp peaks – in 1984 and 1994. The highest rate of unemployment in Canada was at the level of 11.4% (OECD definition) in 1984, and the lowermost one was around 3.8% in 1967. Table 1 shows that the u_t series is likely integrated of order 1.

The rate of change in labor force, l_t , in Figure 3 also has two representations: the OECD and BLS. Both time series are in an excellent agreement and the rate of change is practically identical, except in 1967 and 1976. These are the years of revision to labor force related definitions, with the spikes potentially damaging all LSQ -based statistical inferences. Table 1 indicates that the annual estimates of labor force represent rather an $I(1)$ process. The augmented Dickey-Fuller and Phillips-Perron both reject the null hypothesis of a unit root. However, the DF-GLS test does not reject the null for all lags above 1 (only lag 2 is shown in the Table). The first difference, dl_t , is an $I(0)$ process with all tests rejecting the null hypothesis of a unit root.

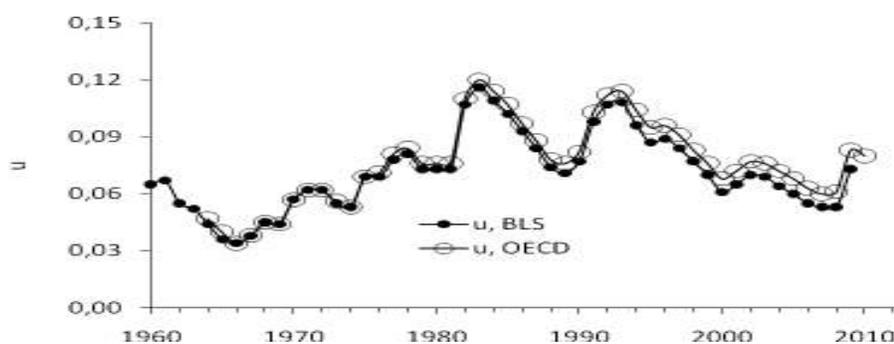


Figure 2. Comparison of two estimates of unemployment according to the U.S. BLS and OECD definitions.

Since linear functional dependences between the three involved $I(1)$ processes are estimated later on, econometric analysis requires specific tests for cointegration. We would not like the results of our statistical estimates to be biased by stochastic trends, as was originally found by Granger (1981) for various economic series.

The main task of this study is to accurately characterize in time and size the structural break associated with the new monetary policy formally introduced in 1991. For this purpose, we use the best fit empirical relationships between inflation/unemployment and labor force. By definition, all relationships are linear and potentially lagged. Technically, this task does not seem to be a difficult one since we use cumulative curves, accompanied by the residual minimization in the L^2 -metric, instead of linear regression applied to the dynamic series. (The latter method provides heavily biased estimates of the slope when both variables have high uncertainties.) We have also tried using the L^1 -metrics as applied to the annual and cumulative curves. However, the overall performance of the L^2 -

metrics makes it a more appropriate for the cumulative curves where large-amplitude outliers are almost absent.

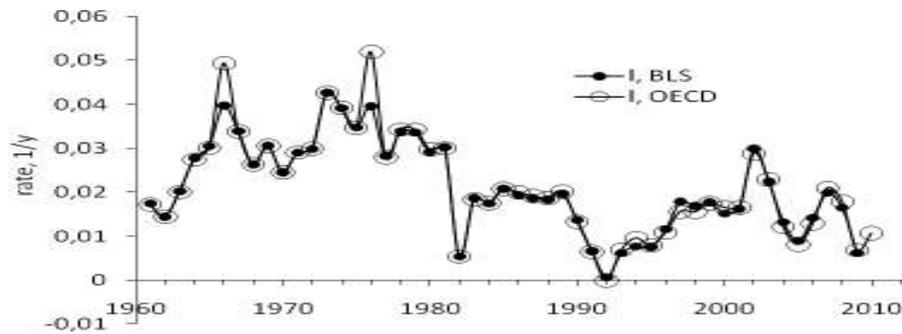


Figure 3. Comparison of two estimates of the change rate of labor force level – as reported by the OECD and BLS.

3. Unemployment as a linear function of the change in labor force

In our previous paper on inflation/unemployment in Canada we demonstrated the absence of the Phillips curve in its original form (Kitov 2007b). From the absent Phillips curve it is only one little step to the dependence of unemployment on the change in labor force: we are looking for a driving force. Actually, we replace the rate of inflation in the Phillips curve with the rate of labor force change. Then, we have to estimate both coefficients in (2). The estimation method is enhanced relative to our previous studies – the best overall fit is sought by the least squares method as applied to the cumulative curves. In addition to the formal *LSQ* minimization of the model error we have introduced a freely varying break year in the model. The break should be within 4 years around the assumed year (1991). By definition, the final break year has to provide the lowermost RMS residual. All in all, the best-fit equations and the break year are as follows:

$$\begin{aligned}
 u_t &= -2.574l_t + 0.155; t < 1990 \\
 u_t &= -2.852l_t + 0.122; t \geq 1990
 \end{aligned}
 \tag{5}$$

with the break in 1990. The change in the break year is likely explained by the influence of measurement noise. As an alternative, one may guess that the Bank of Canada introduced inflation targeting in some testing regime a year before the official start. Figure 4 illustrates the behaviour of the dynamic and cumulative curves. We have intentionally extended the model for the period before 1990 into the 1990s and 2000s in order to demonstrate the structural break in 1990. The cumulative curves clearly deviate since 1990.

In the previous paper, coefficients in (5) were as follows: $b_1 = -2.1$ and $b_2 = -0.12$. The absolute value of the slope was underestimated since the original equation had to fit the whole period between 1969 and 2004. The visual-fit approach and the absence of the structural break made this task a difficult one. The intercept was estimated with a higher accuracy, at least after 1990. Overall, the original model gave a reasonable first approximation.

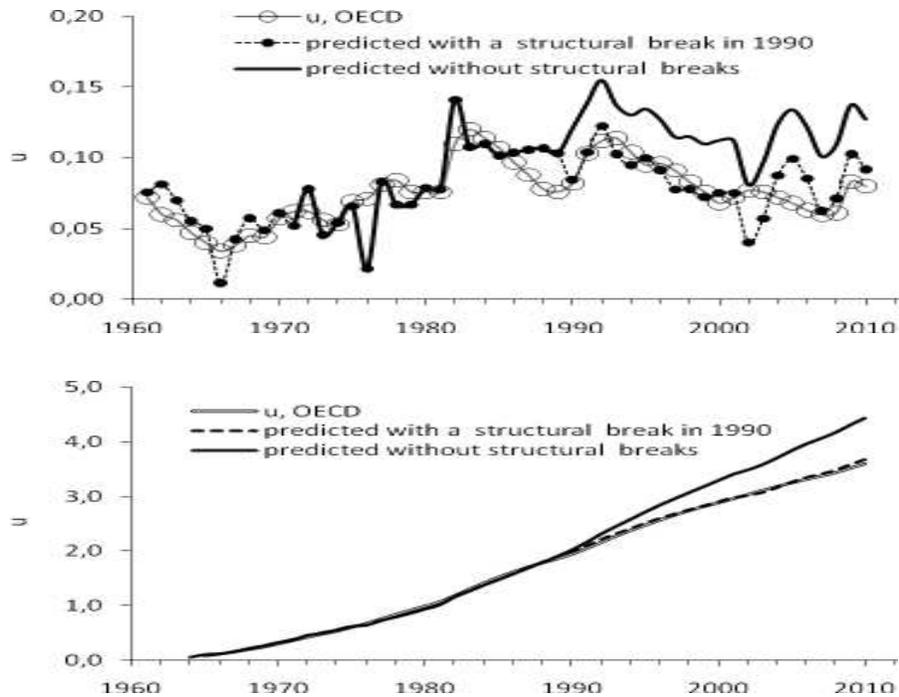


Figure 4. Annual estimates of the rate of unemployment in Canada: measured vs. predicted from the change in labour force.

The slope in (5) is always negative. Therefore, any increase in the level of labour force is reflected in a proportional and simultaneous fall in the rate of unemployment. This is a fortunate link – more people in work force is equivalent to less unemployed. However, when the level of labour force does not change with time the rate of unemployment is very high – around 12% (after 1990). Canada has to keep a higher rate of labour force growth in order to retain the rate of unemployment at low level.

All in all, the model obtained for the previous period diverge after 1990. The difference between the cumulative curves is positive and increases with time. This is a favourable outcome of the new monetary policy – it has reduced the rate of unemployment by approximately 3.6% relative to that predicted by the relationship valid before 1990 (see Figure 5). For the economic theory, it is likely an unexpected result since the Phillips curve implies an opposite behaviour.

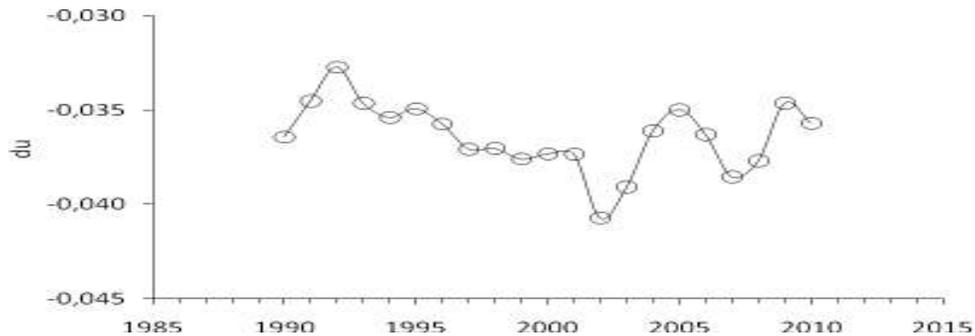


Figure 5. The difference between the observed rate of unemployment in Canada and that predicted by the relationship valid before 1990, i.e. the expected rate of unemployment.

Relationship (5) implies a nonlinear dependence on the rate of participation in labour force. For a given absolute change in the level of labour force, the reaction of unemployment will be different for the rate of participation 56% (1964) and 67.7% (2008). The higher is the participation rate the lower is the change rate, l_t , and thus, the change in the rate of unemployment. Actually, the participation rate

in Canada has been increasing since 1995 to a very high level of 67.7%. It will be a difficult task to retain the rate of unemployment at the current level – it is likely that the rate of participation is approaching the peak level and will start to decline in the near future.

4. Inflation as a linear function of the change in labor force

The existence of a deterministic link between labor force and price inflation has also been proved for many countries. We are following the same estimation procedure as for unemployment above, i.e. the method of cumulative curves enhanced by the *LSQ* minimization of the model error and the break year freely varying around 1991.

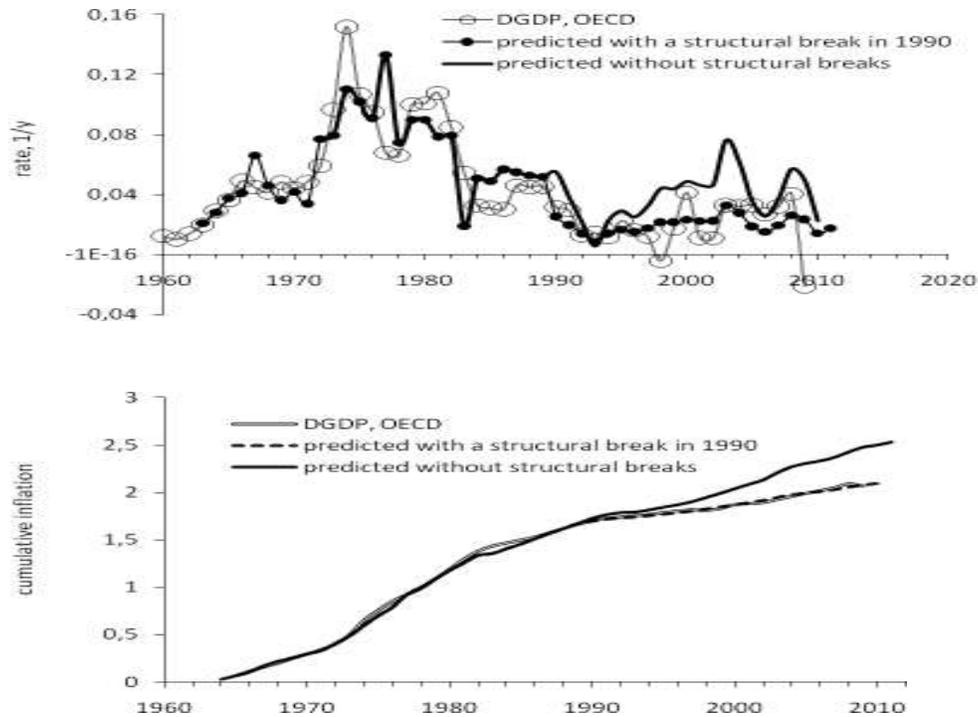


Figure 6. Modeling the annual and cumulative GDP deflator as a function of the change rate of labour force.

We start with annual readings of the GDP deflator reported by the OECD. The minimization procedure with the start break year in 1991 (the change in monetary policy) and zero lag (varied between zero and 5 years) has finally determined the data-driven break year in 1990 and the lag of 1 year:

$$\begin{aligned}
 DGDP_t &= 2.453I_{t-1} + 0.0052; \quad t < 1990 \\
 DGDP_t &= 0.842I_{t-1} - 0.0085; \quad t \geq 1990
 \end{aligned}
 \tag{6}$$

Figure 6 displays the observed DGDP curve and that predicted according to (6). The cumulative curves are in a good agreement. For the period between 1964 and 2009, the coefficient of determination is very high: $R^2_{dyn}=0.70$ and $R^2_{cum}= 0.999$, respectively. Relationship (6) does not use any past or future values of inflation (i.e. there are no AR terms) which usually bring between 80% and 90% of the explanatory power in the mainstream models (Piger, and Rasche 2006; Rudd, and Whelan 2005; Stock, and Watson 2008). Hence, this link is almost a deterministic one. The cumulative curves demonstrate that the left- and right-hand sides in (6) converge with time.

Figure 7 depicts another benefit of the new monetary policy - the rate of price inflation has been reduced by 1.9% per year on average since 1991 relative to that predicted by the early model. Hence, the policy has a significant effect on the price growth in Canada and the Lucas critique was well justified by the reduced rate of unemployment. Unfortunately, this win-win policy is not the only possible outcome of inflation targeting. In France, a similar (with strict constraints on the level of money supply, however) monetary policy introduced in 1994 has resulted in an opposite reaction of unemployment (Kitov 2007a). On average, the observed rate has been approximately 5% above that predicted by the model valid before 1995. This was not a win-win game.

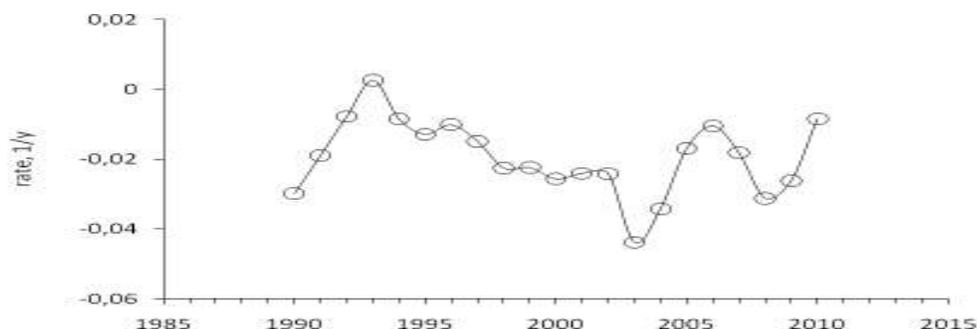


Figure 7. The difference between the measured and expected GDP deflators. The mean value between 1990 and 2009 is $-0.019y^{-1}$.

Figure 8 illustrates the expected benefits of the cumulative approach. The absolute and relative errors decrease with time. Despite the annual levels of price and labour force are not measured more accurately with time the relative change in the level is measured with an increasing accuracy due to the increasing denominator. As a consequence, the observed and predicted cumulative curves, i.e. the overall changes in price and labour force, do converge. They become indistinguishable. Taking into account the lead of the change in labour force by 1 year and its independence on the future rate of inflation one can suggest that there exists a deterministic link between them.

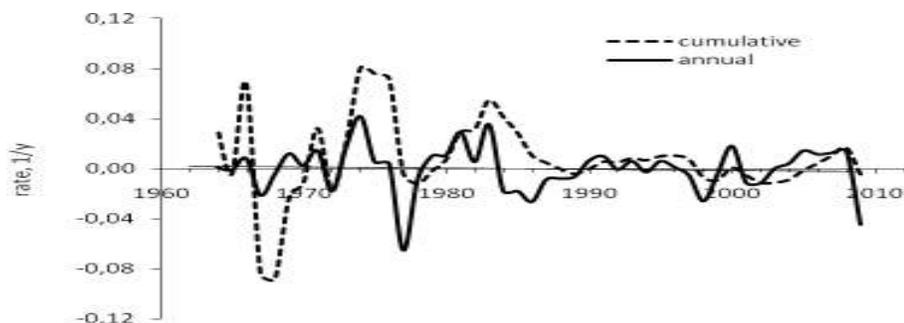


Figure 8. Absolute dynamic and relative cumulative modelling error for the inflation in Figure 6.

The annual time series are relatively short with only 48 readings between 1962 and 2009. Small samples do not guarantee higher confidence of statistical results. However, we have carried our formal tests for cointegration. First, we have tested the differences between the dynamic and cumulative curves, i.e. the model residuals. For the annual residuals, the augmented Dickey-Fuller test is -5.36 with the 1% critical value of -3.61 , i.e. the null of a unit root is rejected. The Phillips-Perron tests gives $z(\rho)=-35.33^*$ (-18.56) and $z(t)=-5.23^*$ (-3.61). The DF-GLS test rejects the null for all lags between 1 and 5, except 4.

For the residuals of the cumulative model, the augmented Dickey-Fuller test is -4.16* with the 1% critical value of -3.61. The Phillips-Perron tests gives $z(\rho)=-26.05^*$ (-18.56) and $z(t)=-4.18^*$ (-3.61). The DF-GLS test rejects the null for all lags between 1 and 5, except 4. Therefore, both residuals have no unit roots. This is an indication that the relevant measured and predicted from labor force time series are likely cointegrated. Such a result for the cumulative curves is not a surprising one – the residual error must have a zero mean despite both series are integrated of order 2.

The Johansen test for cointegration supports the conclusion from the annual residual – the annual measured and predicted curves are cointegrated. The trace statistics gives cointegration rank 1 for two variables. We used the following specifications: trend = "none", maxlag = 3, but the outcome is the same for other trend specifications and maxlag = 7. Formally, the Johansen test cannot be applied to $I(2)$ series and we did not test the cumulative curves.

As mentioned above, small samples usually do not provide statistical estimates and inferences with the desired level of confidence. Fortunately, the OECD also reports quarterly estimates of inflation and labor force. As a rule, monthly and quarterly data are noisy because of measurement errors. For the Canadian time series the overall measurement accuracy is not poor and we have obtained the estimates of coefficients in the linear link between the annual change rate of the GDP deflator for each quarter (annualized Q/Q) and l_i :

$$\begin{aligned}
 DGDP_t &= 3.0l_{t-8} - 0.0045; t \geq 1989 \\
 DGDP_t &= 2.0l_{t-8} - 0.0020; t \leq 1989
 \end{aligned}
 \tag{7}$$

where the lag is 8 quarters and the break year is 1989. The change in the lag and break is likely associated with extremely high volatility of quarterly estimates. Thus, this model is a crude one. The change in monetary policy did introduce a tangible disturbance in the link between inflation and labor force. Figure 9 presents the quarterly curves for observed and predicted inflation, both smoothed with MA(8). The resemblance is relatively good.

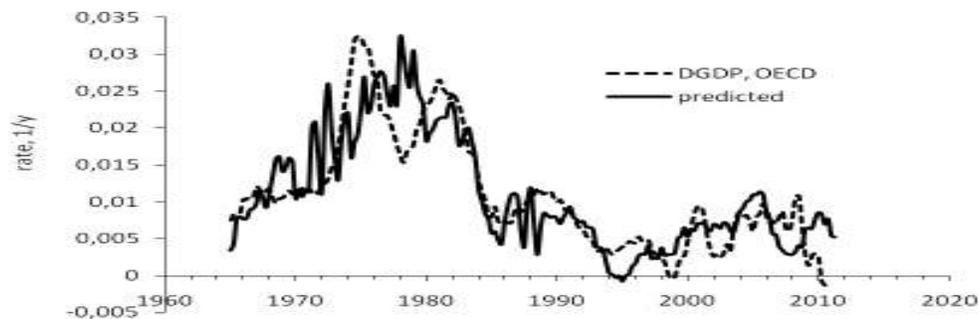


Figure 9. Modelling the quarterly DGDP estimates, both curves are smoothed with MA(8).

We have tested the smoothed time series for cointegration. In the Engle-Granger test for cointegration, the residual error of linear regression should not have unit roots. Figure 10 depicts the model residual, which we consider as an equivalent of the regression residual error. For 188 readings, the augmented Dickey-Fuller (DF) test $z(t)=-4.37^*$ with the 1% critical value of -3.48. The DF-GLS test rejects (for 1% critical value) the null of a unit root for lags 1, 5 and 6 (quarters). The Phillips-Perron test for unit roots gave $z(\square)=-35.95^*$ and $z(t)=-4.50^*$, with the 1% critical value of -20.07 and -3.48, respectively. Therefore, all tests for unit roots prove that the predicted time series is cointegrated with the observed one. The Johansen test confirms the presence of a cointegration relation. Econometrically, there exists a long term equilibrium relation between the rate of inflation and the change in labor force in Canada with a break around 1990. This makes the above results of linear regression unbiased.



Figure 10. The model residual from Figure 9.

The overall consumer price index allows corroboration of the results obtained for the GDP deflator. We apply the same technique to the annual readings of CPI inflation reported by the OECD. The minimization procedure with the start break year in 1991 (the change in monetary policy) and zero lag (varied between zero and 5 years) has finally determined the data-driven break year in 1991 and the lag of 3 years:

$$CPI_t = 2.682l_{t-3} - 0.0035; t < 1991$$

$$CPI_t = 0.625l_{t-3} + 0.0104; t \geq 1991 \quad (7)$$

Considering the difference between DGDP and CPI in Figure 1 the change in lag is not a surprise. At the same time, the break year fits the introduction of inflation targeting. Figure 11 depicts the annual and cumulative curves; the latter also includes a model without structural break. The annual curves are smoothed with MA(3) and demonstrate a very high degree of similarity for the period between 1964 and 2010 with $R^2=0.89$. For the annual estimates, $R^2=0.68$ and for the cumulative ones $R^2=0.999$. These estimates are not bogus when the annual time series are cointegrated.

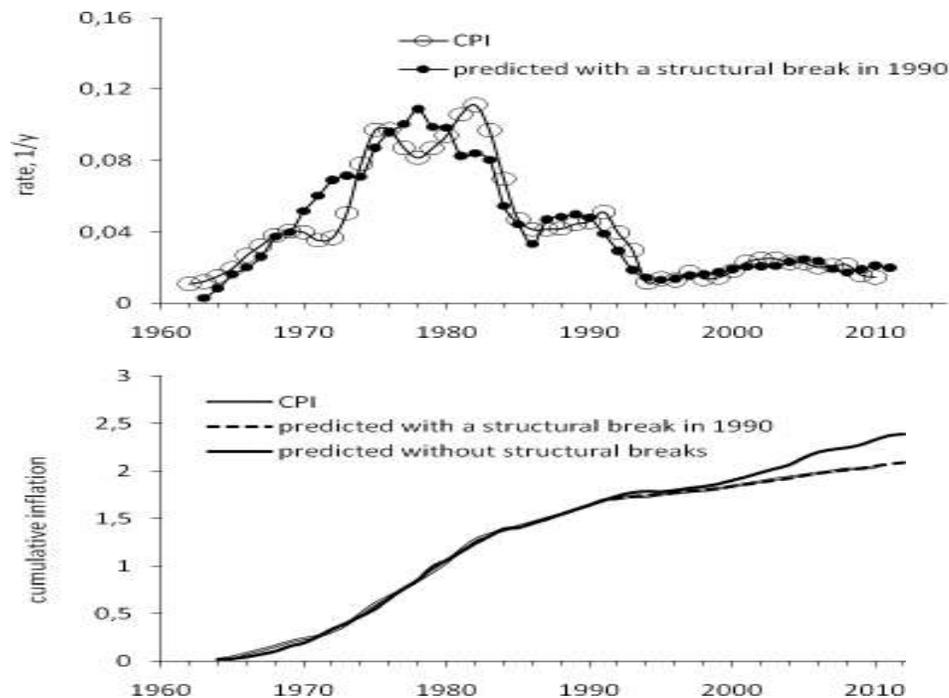


Figure 11. Modeling the annual and cumulative CPI inflation as a function of the change rate of labor force. The structural break was found in 1991. Both annual curves are smoothed with MA(3).

There are 47 readings between 1964 and 2010. We have tested the differences between the dynamic and cumulative curves, i.e. the model residuals, for unit roots. For the annual residuals, the augmented Dickey-Fuller test is -5.83^* with the 1% critical value of -3.61 , i.e. the null of a unit root is rejected. The Phillips-Perron tests gives $z(\rho)=-31.83^*$ (-18.63) and $z(t)=-5.78^*$ (-3.61). The DF-GLS test rejects the null for all lags between 1 and 5. Hence, there is no unit root in the model residual, i.e. the rate of CPI inflation and the change in labor force are cointegrated, when one introduces a structural break in the cointegrating relation in 1991. The Johansen test gives rank 1 and confirms the presence of one cointegrating relation between the measured and predicted inflation. The driving force leads by 3 years creating a natural forecast horizon of the same length. The standard deviation in the predicted series (i.e. a three-year-ahead inflation estimate) is $0.024y^{-1}$. This value is smaller than the RMSE of the naïve prediction (Atkeson, and Ohanian 2001) at the same 3-year horizon, $0.028y^{-1}$. When one smoothes the predicted inflation series with MA(3) the forecast horizon falls to 2 years. Then the RMSFE of our model is only $0.018y^{-1}$ compared to $0.023y^{-1}$ for the naïve prediction at a 2-year horizon.

Taking into account the cointegrating relations estimated for the DGDP and CPI series one can conclude that the change in labor force has been driving inflation (at least) since the beginning of 1960s. The structural break associated with the introduction of inflation targeting definitely induced shifts in all coefficients, but did not change the linear functional dependence and the lag of inflation. This finding may be interpreted as a shift from one stationary regime of the Canadian economy to another regime, also a stationary one.

All in all, the new monetary policy has affected inflation and unemployment, and both in a desired direction. This confirms the correctness of the Lucas critique. However, both variables are still driven by the change in labour force. Moreover, the joint effect of inflation targeting is zero when the generalized model is applied, i.e. the change in unemployment is fully compensated by the change in inflation a year (or three years) later when equation (3) or (4) is applied.

5. The generalized model

In Sections 2 and 3, we have estimated several individual links between labor force, unemployment and inflation. Both individual relations to labor force are cointegrated, as the Engle-Granger, and Johansen tests have shown. However, there was a structural break in 1991 induced by the introduction of new monetary policy. In this case, the estimation of a generalized model is a mandatory one. Since inflation lags behind the rate of unemployment and the change in labor force we have estimated model (4) for DGDP and CPI separately:

$$\begin{aligned} DGDP_t &= 3.70l_{t-1} + 0.55u_{t-1} - 0.076 \\ CPI_t &= 3.40l_{t-3} + 0.55u_{t-3} - 0.073 \end{aligned} \tag{8}$$

Coefficients in (8) are similar for both measures of inflation with a little higher influence of labor force on the DGDP. This might be a result of the higher volatility, but the effect of l_t is compensated by a slightly lower intercept of -0.076 . The influence of unemployment is essentially the same. The most important finding is that there is no sign of the 1991 structural break in (8) and one equation covers the entire period between 1965 and 2010. This is an obvious consequence of the balance between inflation and unemployment in (8). When the rate of unemployment falls by 3.6% per year the rate of inflation also drops by $0.55 \cdot 3.6\% = 2\%$. The estimated value of inflation fall after 1991 is 1.9% per year.

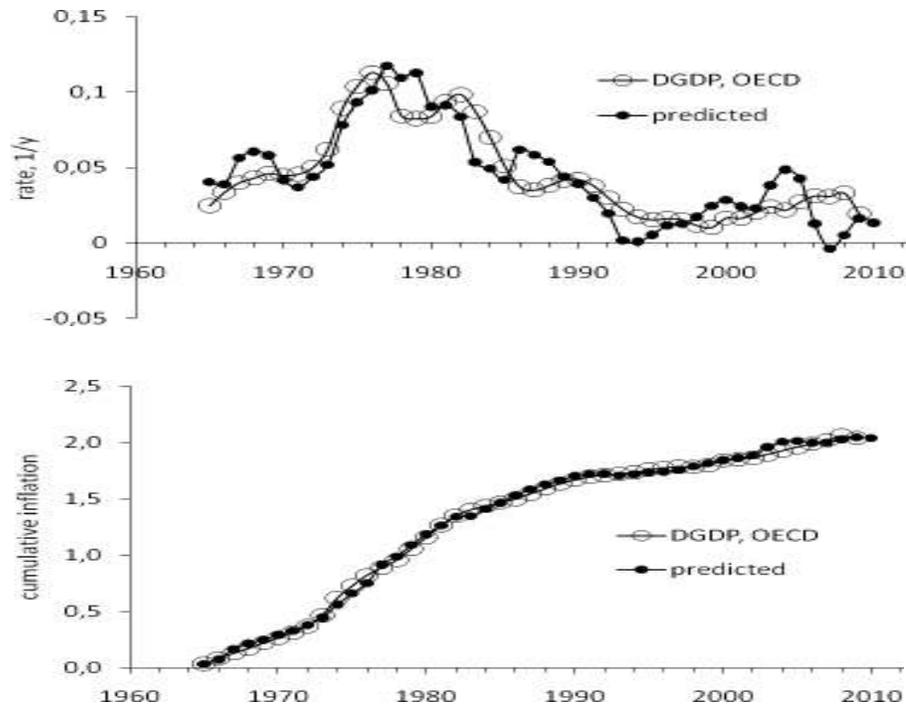
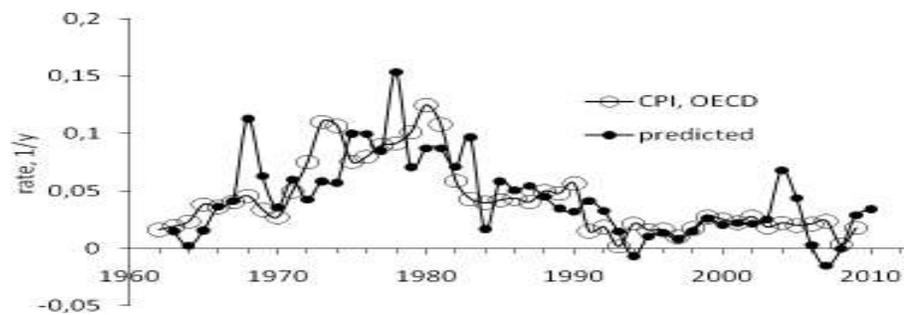


Figure 12. *Upper panel:* Illustration of the generalized relation between inflation, unemployment and the change rate of labor force level in Canada.

Note: The GDP deflator is modeled using the change rate of labor force level and unemployment. Both series are smoothed with MA(3). *Lower panel:* These cumulative curves were used to estimate all coefficients in (8).

Figures 12 and 13 present the measured and predicted inflation. The annual series are characterized by $R^2=0.52$ in both cases. In Figure 12, we have smoothed the annual curves with MA(3) and the curves are very close to each other. The difference between the annual series has no unit roots as the augmented Dickey-Fuller (-5.48^*) and the Phillips-Perron ($z(\rho)=-34.47^*$ and $z(t)=-5.47^*$) tests show. Thus, there is no unit root in the model residual.



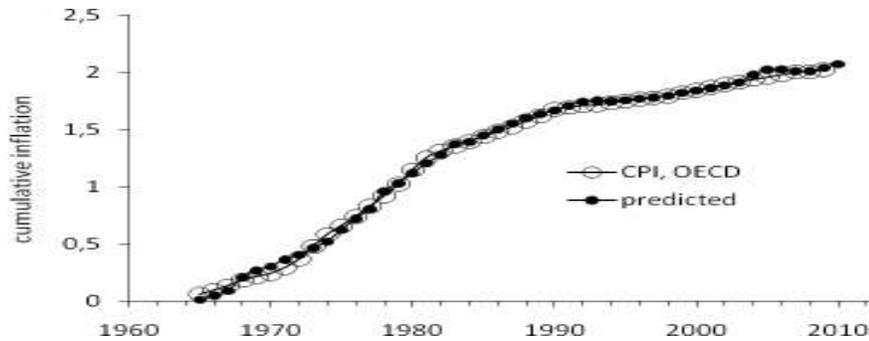


Figure 13. *Upper panel:* Illustration of the generalized relation between inflation, unemployment and the change rate of labor force level in Canada.

Note: The CPI inflation is modeled using the change rate of labor force level and unemployment. *Lower panel:* These cumulative curves were used to estimate all coefficients in (8).

In Figure 13, we did not smooth the annual curves in order to demonstrate the reason for a relatively low R^2 . As discussed in Section 1, there are artificial breaks in the units of labor force and unemployment measurements in 1967 and 1976. One can also suggest that there was a major revision in 1982. After 2005, there is a high-amplitude oscillation potentially catastrophic for any quantitative modelling. All these spikes deteriorate the result of linear regression. However, there is no unit root in the difference between the observed and predicted rate of inflation, as the ADF (-5.47*) and the PP (35.78* and -5.49*) tests demonstrate.

6. Conclusion

The Lucas critique was correct. The manipulations associated with the introduction of the new monetary policy in 1991 produced a substantial effect on the long-term equilibrium relation between the rate of price inflation and the change in labor force. Amazingly, the monetary policy had a highly positive side effect of a lowered unemployment. In 2010, the rate of unemployment would be around 12% without the inflation targeting. In France, the effect of a similar monetary policy, adapted by the Bank de France in 1995, is opposite – lowered price inflation resulted in the rate of unemployment as high as 12% or ~5 percentage points above the rate without the new policy (Kitov 2007a).

All in all, the rate of price inflation and unemployment in Canada is a one-off function of the change in labor force. This conclusion validates the previous model for Canada and the models for many developed countries: the U.S., Japan, Germany, France, Italy, Canada, the Netherlands, Sweden, Austria, and Switzerland.

Overall, we have established that there exist long term equilibrium relations between the rate of labor force change and the rate of inflation/unemployment. The level of statistical significance of these cointegrating relations in the absence of AR-terms allows us to consider these links as deterministic ones, as adapted in physics. This does not make the rate of unemployment and inflation non-stochastic time series. The change in labor force includes a strong demographic component, and thus, is stochastic to the extent the evolution of population in a given country is stochastic. Since the level of labor force is a measurable value one does not need a data generating process in order to describe its stochastic properties – they are obtained automatically with routine measurements.

References

- [1] Atkeson, A., and Ohanian, L. 2001. Are Phillips Curves Useful for Forecasting Inflation? *Federal Reserve Bank of Minneapolis Quarterly Review*, 25(1), 2–11.
- [2] Bank of Canada. 2010. Monetary policy. Retrieved 26.03.2011, http://www.bank-banque-canada.ca/en/monetary/inflation_target.html.
- [3] Benati, L. 2009. Are “intrinsic inflation persistence” models structural in the sense of Lucas (1976)? ECB Working paper series, No. 1038.

- [4] Binette, A., Martel, S. 2005. Inflation and Relative Price Dispersion in Canada: An Empirical Assessment, Bank of Canada, Working Paper 2005-28, Ottawa.
- [5] Bureau of Labor Statistic. 2007. Foreign Labour Statistic. Table, retrieved at 20.07.2007 from <http://data.bls.gov/PDO/outside.jsp?survey=in>.
- [6] Chiarella, C., and Gao, S. 2002. Type I spurious regression in econometrics. Working Paper No 114, School of Finance and Economics, University of Technology Sydney.
- [7] Granger, C. 1981. Some Properties of Time Series Data and Their Use in Econometric Model Specification, *Journal of Econometrics* 16, 121-130.
- [8] Hostland, D. 1995. Changes in the inflation process in Canada: Evidence and implications, Bank of Canada, Working paper 95-5, Ottawa.
- [9] Kitov, I. 2006. Inflation, unemployment, labour force change in the USA. Working Papers 28, ECINEQ. Society for the Study of Economic Inequality.
- [10] Kitov, I. 2007a. Inflation, Unemployment, Labour Force Change in European countries. In T. Nagakawa (Ed.), *Business Fluctuations and Cycles* (pp. 67-112). Hauppauge NY: Nova Science Publishers.
- [11] Kitov, I. 2007b. Exact prediction of inflation and unemployment in Canada, MPRA Paper 5015, University Library of Munich, Germany.
- [12] Kitov, I., and Kitov, O. 2008. The Driving Force of Labor Force Participation in Developed Countries. *Journal of Applied Economic Sciences*, III(3(5)_Fall), 203-222.
- [13] Kitov, I., and Kitov, O. 2010. Dynamics of Unemployment and Inflation in Western Europe: Solution by the 1-D Boundary Elements Method. *Journal of Applied Economic Sciences*, V(2(12)_Summer), 94-113.
- [14] Kitov, I., Kitov, O., and Dolinskaya, S. 2007. Inflation as a function of labour force change rate: cointegration test for the USA. MPRA Paper 2734. University Library of Munich, Germany.
- [15] Lucas, R. 1976. Econometric policy evaluation. A critique. *Cornegie-Rochester Conference Series on Public Policy*, 1, 19-46.
- [16] Page, E.S. 1954. Continuous Inspection Scheme. *Biometrika* 41 (1/2): 100–115.
- [17] Phillips, A.W. 1958. The Relationship between Unemployment and the Rate of Change of Money Wages in the United Kingdom 1861-1957. *Economica* 25 (100), 283–299.
- [18] Piger, J., and Rasche, R. 2006. Inflation: do expectations trump the gap? Working Papers 2006-013. Federal Reserve Bank of St. Louis.
- [19] Rossiter, J. 2005. Measurement Bias in the Canadian Consumer Price Index. Bank of Canada, Working Paper 2005-39, Ottawa.
- [20] Rudd, J., and Whelan, K. 2005. New Tests of the New-Keynesian Phillips Curve. *Journal of Monetary Economics*, 52(6), 1167–1181.
- [21] Statistics Canada. 2011. History of the Labour Force Survey prior to November 2000. Retrieved 27.03.2011, http://www.statcan.gc.ca/imdb-bmdi/document/3701_D7_T9_V1-eng.pdf.
- [22] Stock, J., and Watson, M. 2003. Forecasting Output and Inflation: The Role of Asset Prices. *Journal of Economic Literature* 41(3), 788–829.
- [23] Stock, J., and Watson, M. 2007. Why has U.S. inflation become harder to forecast? *Journal of Money, Credit and Banking*, 39(1), 3-34.
- [24] Stock, J., and Watson, M. 2008. Phillips Curve Inflation Forecasts. NBER Working Papers 14322. National Bureau of Economic Research.

FINANCIAL DEEPENING AND ECONOMIC GROWTH IN THE EUROPEAN TRANSITION ECONOMIES

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Abstract:

Various effects of the financial deepening came to the centre of academics as well as policy-makers discussions during last four decades especially in relation to the financial sector development. Together with financial liberalization and international financial integration economists focus their attention to the financial deepening especially due to its potential effects on the real economy. Perspective of the fast and sustainable economic growth at the end of the 1990s increased an attractiveness of the European transition economies (ETE) for the foreign investors that resulted in increased foreign capital inflows to ETE. International capital inflows (especially debt and portfolio capital flows) stimulate financial deepening through higher demand for financial services. As the underdeveloped financial markets obviously constrain domestic capital mobilization, the international financial integration is considered to be very useful vehicle in fostering financial sector advancement. One of the most discussed areas related to the overall effects of the financial deepening is a bi-directional relationship between financial development and economic growth. It is generally expected there is a positive effect of financial development on economic growth. On the other hand especially some country-specific institutional characteristics and different policies may significantly distort positive incentives of the financial deepening.

In the paper we analyze the main aspects of the financial deepening in ten ETE in the period 2000-2010 using vector error correction model (VECM). In order to meet this objective we implement a multivariate cointegration methodology introduced by Johansen (1988, 1991) and Johansen and Juselius (1990) to estimate the relationships between financial depth indicators and real output in the selected group of countries. To find the order of integration of endogenous variables we test the time series for the unit root presence. In order to determine cointegrating (long-run) relationships, we follow a Johansen cointegration procedure to perform the trace test and maximum eigenvalue test. We also test the direction of the causality relationships between financial depth indicators and real output using linear Granger causality test. Using the estimated VEC model, the dynamic responses of the endogenous variables to the money stock, domestic bank deposits and domestic bank loans one standard deviation shocks are computed for each country from the group of ETE.

Keywords: financial deepening, economic growth, vector error correction model, granger causality, impulse-response function

JEL Classification: F43, G14, G15, O16

1. Introduction

Various effects of the financial deepening came to the centre of academics as well as policy-makers discussions during last four decades especially in relation to the financial sector development. Together with financial liberalization and international financial integration economists focus their attention to the financial deepening especially due to its potential effects on the real economy. Size of the financial sector is usually closely related to the overall economic performance of the country. It seems the higher is the per capita income in the country the faster is the growth in the financial assets.

Perspective of the fast and sustainable economic growth at the end of the 1990s increased an attractiveness of ETE¹² for the foreign investors that resulted in increased foreign capital inflows to ETE (Stiglitz 2000; Rose 2005). As a result many countries from the group worsened their international debt position. While the effects of the foreign direct investments are well described in the present literature, the role of the portfolio investments is typically underestimated. It is typically the result of the low developed domestic financial markets in ETE (Buiter, Taci 2002; Blanchard 1984). In

¹² To the informal group named as European transition economies we consider new European Union member countries - the former central planning economies including Bulgaria, Czech republic, Estonia, Lithuania, Latvia, Hungary, Poland, Romania, Slovak republic and Slovenia.

addition to this obvious trend, changes in the external capital portfolio structure reflected the progress in the domestic economic, institutional and financial system reforms, increasing the reliance of foreign investors to allocate more direct and portfolio equity investments in those countries. In comparison with the old EU member countries the effects of the international capital flows in ETE doesn't necessarily reach the generally expected intensity, while the overall outcome can be distorted or even opposite (Edwards 2001; Edison, Ross, Luca, Torsten 2002; Bekaert 2005).

International capital inflows (especially debt and portfolio capital flows) stimulate financial deepening through higher demand for financial services. As the underdeveloped financial markets obviously constrain domestic capital mobilization, the international financial integration is considered to be very useful vehicle in fostering financial sector advancement.

As the main determinants of continuously rising depth of the domestic financial sector in ETE in the last decade we consider:

- Financial liberalization (consistent releasing of the international capital flows restrictions) started in the second half of the 1990s followed by the macroeconomic stabilization after the periods of imbalanced economic growth that many ETE experienced in the second half of the 1990s.

- Persisting low domestic capital base (imbalance between domestic savings and investments that resulted in long-lasting current account deficits) stimulated significant foreign capital inflows.

- Rising competition among domestic commercial banks (in many ETE it was especially due to an integration of domestic banks into the international financial groups through the process of their privatisation).

- Improving legislation framework (advancing legal and regulatory framework of the financial system raises its overall efficiency and reliability and thus foster the financial deepening).

- Decreasing domestic interest rates (due to monetary policy conditions softening resulted from macroeconomic stability that all ETE achieved at the certain point of their transition process).

One of the most discussed areas related to the overall effects of the financial deepening is a bi-directional relationship between financial development and economic growth. It is generally expected there is a positive effect of financial development on economic growth. On the other hand especially some country-specific institutional characteristics and different policies may significantly distort positive incentives of the financial deepening.

In the paper we analyze the main aspects of the financial deepening in ten ETE in the period 2000-2010 using vector error correction model (VECM). In order to meet this objective we implement a multivariate cointegration methodology introduced by Johansen (1988, 1991), and Johansen, and Juselius (1990) to estimate the relationships between financial depth indicators and real output in the selected group of countries. To find the order of integration of endogenous variables we test the time series for the unit root presence. In order to determine cointegrating (long-run) relationships, we follow a Johansen cointegration procedure to perform the trace test and maximum eigenvalue test. We also test the direction of the causality relationships between financial depth indicators and real output using linear Granger causality test. Using the estimated VEC model, the dynamic responses of the endogenous variables to the money stock, domestic bank deposits and domestic bank loans one standard deviation shocks are computed for each country from the group of ETE.

2. Overview of the literature

The progress in the financial sector development and the financial deepening in the European transition countries (Buitier, Taci 2003) are considered to be a crucial aspect of the continuously increasing process of the international financial integration. Of course, institutional aspects, heritage from the central planning period and transitional rigidities has fundamentally affected the overall progress as well as durability of partial steps shaping the individual features of the financial sector development and the financial deepening in each particular country. Hence we assume the financial sector development in the European transition countries became even more complicated and country specific when comparing with the financial integration process.

Positive effects of financial deepening are well documented in both theoretical and empirical literature. On the other hand it is not clear how to estimate general linkage and relationship between (a) the financial sector development and the financial deepening and (b) the international financial integration. For example Eichengreen (1997) suggests that the financial integration leads to the financial deepening (to more active, liquid and efficient domestic financial markets), and that the

financial deepening encourages higher investments, faster growth and more rapidly rising living standards. The linkage between the financial integration and the financial deepening is evident from the fact that countries facing relatively large capital inflows have seen disproportionate growth in the volume of transactions on their stock markets, disproportionate growth in stock market capitalization, and disproportionate growth in bank loans to the private sector.

Rousseau, and Wachtel (2007) emphasizes that in order to get benefits from the financial deepening associated with the foreign capital inflows the country should liberalize capital account transactions only when the legal and regulatory institutions were successfully well developed.

Hasan, Wachtel, and Zhou (2007) argue that the financial deepening and the international financial integration is not necessary accompanied only with the positive influence on the domestic transition economy (i.e. economic growth) and the overall effect is largely determined by the financial deepening features and the structure of the foreign capital inflows. While the capital market depth has usually a strong influence on the growth the bank credits may have non-significant or sometimes even negative impact on the growth. At the same time the equity and debt capital inflows have obviously positive influence on the economic growth. Mohan (2006) assumes that the financial deepening has usually overall positive macroeconomic outcomes, but on the microeconomic level it is rather questionable, whether such performance incentives also extend to small and medium enterprises. He also emphasizes that it is rather inconclusive, whether intensified financial intermediation usually coupled with the financial deepening also includes small and medium enterprises. On the other hand the international financial integration is usually coupled with broad set of the microeconomic collateral benefits, i.e. increased quality of institutions and the corporate governance.

Calderón (2002) employed the Geweke decomposition test (Geweke 1982) on pooled data of 109 developing and industrial countries from 1960 to 1994 to examine the direction of causality between financial development and economic growth. The paper finds that (1) financial development generally leads to economic growth; (2) the Granger causality from financial development to economic growth and the Granger causality from economic growth to financial development coexist; (3) financial deepening contributes more to the causal relationships in the developing countries than in the industrial countries; (4) the longer the sampling interval, the larger the effect of financial development on economic growth; (5) financial deepening propels economic growth through both a more rapid capital accumulation and productivity growth, with the latter channel being the strongest.

Christopoulos, Tsionas (2004) investigated the long run relationship between financial depth and economic growth, utilizing the data in the most efficient manner via panel unit root tests and panel cointegration analysis for 10 developing countries. Threshold cointegration tests were also implemented together with dynamic panel data estimation for a panel-based vector error correction model. The long run relationship was estimated using fully modified OLS. Their analysis confirmed an idea that there exists a unique cointegrating vector between growth, financial development and ancillary variables. The empirical evidence also points to the direction that there is no short run causality between financial deepening and output, so the effect is necessarily long run in nature.

Rachdi, Mbarek (2011) investigated the direction of causality between finance and growth using panel data cointegration and GMM system approaches. Their empirical analysis is based on a sample of 10 countries, 6 from the OECD region and 4 from the MENA region during 1990-2006, reports the following results: a panel data cointegration analysis confirms a long-term relationship between financial development and economic growth for the OECD and the MENA countries. Results support the idea that the causality is bidirectional for the OECD countries and unidirectional (economic growth - financial development) for the MENA countries.

Apergis, Filippidis, Economidou (2007) examines whether a long-run relationship between financial development and economic growth exists employing panel integration and cointegration techniques for a dynamic heterogeneous panel of 15 OECD and 50 non-OECD countries over the period 1975–2000. Their findings support the existence of a single long-run equilibrium relation between financial deepening, economic growth and a set of control variables.

Pradhan (2010) analyzed the long run equilibrium nexus between financial deepening, foreign direct investment (FDI) and economic growth in India during 1970-2007. Using Johansen's cointegration technique, the author investigated that financial deepening; foreign direct investment and economic growth are cointegrated, indicating the continuation of long run equilibrium relationship

between them. The ECM further confirmed the presence of bidirectional causality between foreign direct investment and economic growth and a unidirectional causality from financial deepening to foreign direct investment. Abu-Bader, Abu Quarn (2006) examined the causal relationship between financial development and economic growth in five Middle Eastern and North African (MENA) countries for different periods ranging from 1960 to 2004 implementing VAR framework. Authors employed four different measures of financial development and applied Granger causality tests using cointegration and VEC methodology. Their results showed weak support for a long-run relationship between financial development and economic growth.

3. Econometric model

In order to analyze the effects of the financial deepening on the economic growth in ten ETE we estimate a vector error correction model. The paper implements a multivariate cointegration methodology introduced by Johansen (1988, 1991), and Johansen, and Juselius (1990) to estimate the relationships between financial depth indicators and real output in the selected group of countries. Johansen method is applied to the unrestricted vector autoregression (VAR) model that can be written by the following moving average representation of n non-stationary variables containing p lagged values:

$$Y_t = \mu + A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \varepsilon_t \quad (1)$$

where Y_t is a $n \times 1$ vector of the contemporaneous endogenous variables, μ is a $n \times 1$ vector of the constants, A_i are $n \times n$ polynomial variance-covariance matrix, $\varepsilon_t \sim N_n(0, \Sigma_\varepsilon)$ is a $n \times 1$ normalized vector of exogenous shocks (innovations) to the model representing unexplained changes in the variables. If at least two of the variables are cointegrated of the order one (I(1)) the VAR representation in the equation (1) can be rewritten by subtracting Y_{t-1} to the following vector error correction model (VECM):

$$\Delta Y_t = \mu + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

where ΔY_t is a $n \times 1$ vector of the first differences of stochastic variables Y_t , $\Pi = \sum_{i=1}^p A_i - I$,

$\Gamma_i = -\sum_{j=i+1}^p A_j$, I is $n \times n$ identity matrix. Presented VECM contains information on both short-term and long-term adjustments to changes in Y_t included in estimated Γ and Π respectively. Γ is a $n \times n$ vector that represents the short-term dynamic - adjustments to changes in Y_t . Π is a $n \times n$ vector which represents a matrix of the long-run coefficients - the cointegrating relationships (cointegrating vectors) and of the error correction term. Π can be decomposed as follows:

$$\Pi = \alpha \beta' \quad (3)$$

where α represents $n \times r$ a vector of loading matrices containing coefficients that describe the contribution of the r long-term (cointegrating) relationships in the individual equations and denotes the speed of adjustment from disequilibrium, while β is a $n \times r$ matrix of long-run coefficients and represents the r linearly independent cointegrating vectors (each column of β is the cointegrating vector). The number of cointegrating relations among variables of Y_t is the same as the rank (r) for the matrix Π . If it has a full rank, the rank $r = n$ and it means there are n cointegrating relationships and that all variables are I(0). If a vector Y_t is a vector of endogenous variables that are I(1), then all terms in equation (2) are I(0), and ΠY_{t-1} must be also stationary for $\varepsilon_n \sim I(0)$ to be white noise. If the

matrix Π has reduced rank, $r < n$, there are $n - 1$ cointegrating vectors and even if all endogenous variables in the model are $I(1)$, the level-based long-run component would be stationary. VECM requires there exists at least one cointegrating relationship.

In order to find a presence of cointegrating (long-run) relationships, we use the trace test and maximum eigenvalue test. Determination of rank and estimation of the coefficients are computed as maximum likelihood estimation. The corresponding likelihood-ratio test statistics are:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \quad \lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (4)$$

where r is the number of cointegrating vectors under the null hypothesis and $\hat{\lambda}$ is the estimated value for the i^{th} ordered eigenvalue from the Π matrix. Under the trace statistic, the null hypothesis that the number of cointegrating vectors is less than or equal to r is tested against the alternative that there are more than r vectors. Whereas under the maximum eigenvalue test the null hypothesis that there are r cointegrating vectors is tested against the alternative of $r + 1$ cointegrating vectors.

Once we estimate VECM, the short-run relationships can be calculated implementing impulse-response functions (IRF). IRF shows the response of each variable in the system to the shock in any of the other variables. In order to calculate the IRF it is necessary to apply a transformation matrix, B , to the innovations so that they become uncorrelated. The IRF should be calculated from the following moving average representation of the VECM:

$$Y_t = \sum_{i=0}^{\infty} A_i \varepsilon_{t-i} \quad t = 1, 2, \dots, T \quad (5)$$

where T is a number of usable observations and $n \times n$ coefficient matrices A_i ($i = 2, \dots, p$) are recursively calculated using the following expression:

$$A_i = \Phi_1 A_{i-1} + \Phi_2 A_{i-2} + \dots + \Phi_p A_{i-p} \quad (6)$$

with $A_0 = I_n$; $A_i = 0$ for $i < 0$; $\Phi_1 = I + \Pi + \Gamma_1$, $\Phi_i = \Gamma_i - \Gamma_{i-1}$ ($i = 2, \dots, n$).

The Cholesky method uses the inverse of the Cholesky factor of the residual covariance matrix in order to orthogonalize the impulses. This method imposes an ordering of the variables and attributes all of the effect of any common component to the variable that comes first in the system. Responses can change if the ordering of the variables change.

Before estimating the model we have to test the time series for stationarity. Due to Engle, and Granger (1987) it is necessary that all variables within the cointegration relationship must have the same order of integration. In addition, the time series should not be $I(0)$, since this will lead to trivial cointegrating vectors. We also test the direction of the causality relationships between financial depth indicators and real output using linear Granger causality test defined by the following expression: x_t is said to does not Granger-cause y_t , if

$$E(y_{t+p} | \Omega_t) = E(y_{t+p} | \Omega_t - x_t) \quad (\forall p > 0) \quad (7)$$

where x_t and y_t are two times series, Ω_t is all the information available at time T and $(A|B)$ is the conditional distribution of A given B.

The expression (7) can be also explained as follows: x_t is said to not Granger-cause y_t if cannot help predict future y .

Using the estimated VEC model, the dynamic responses of the endogenous variables to the money stock, domestic bank deposits and domestic bank loans one standard deviation shocks are

computed for each country from the group of ETE. In order to meet the objective of the article to estimate the main aspects of the financial deepening in ETE in the period 2000-2010 we focus our attention to interpret the responses of the real output to the stock of money, domestic deposits and domestic loans one standard deviation innovation.

4. Data and results

We use quarterly data ranging from 2000Q1 to 2010Q4 (44 observations) for the financial depth indicators (represented by the shares of broad money stock M2 (*m*), domestic bank deposits (*d*) and domestic bank loans (*l*) to GDP), GDP (*y*), inflation (*p*) represented by the adjusted domestic consumer price index (indicator of core inflation), nominal effective exchange rate (NEER) (*e*), and short-term interest rates (*i*) (Figure 1).

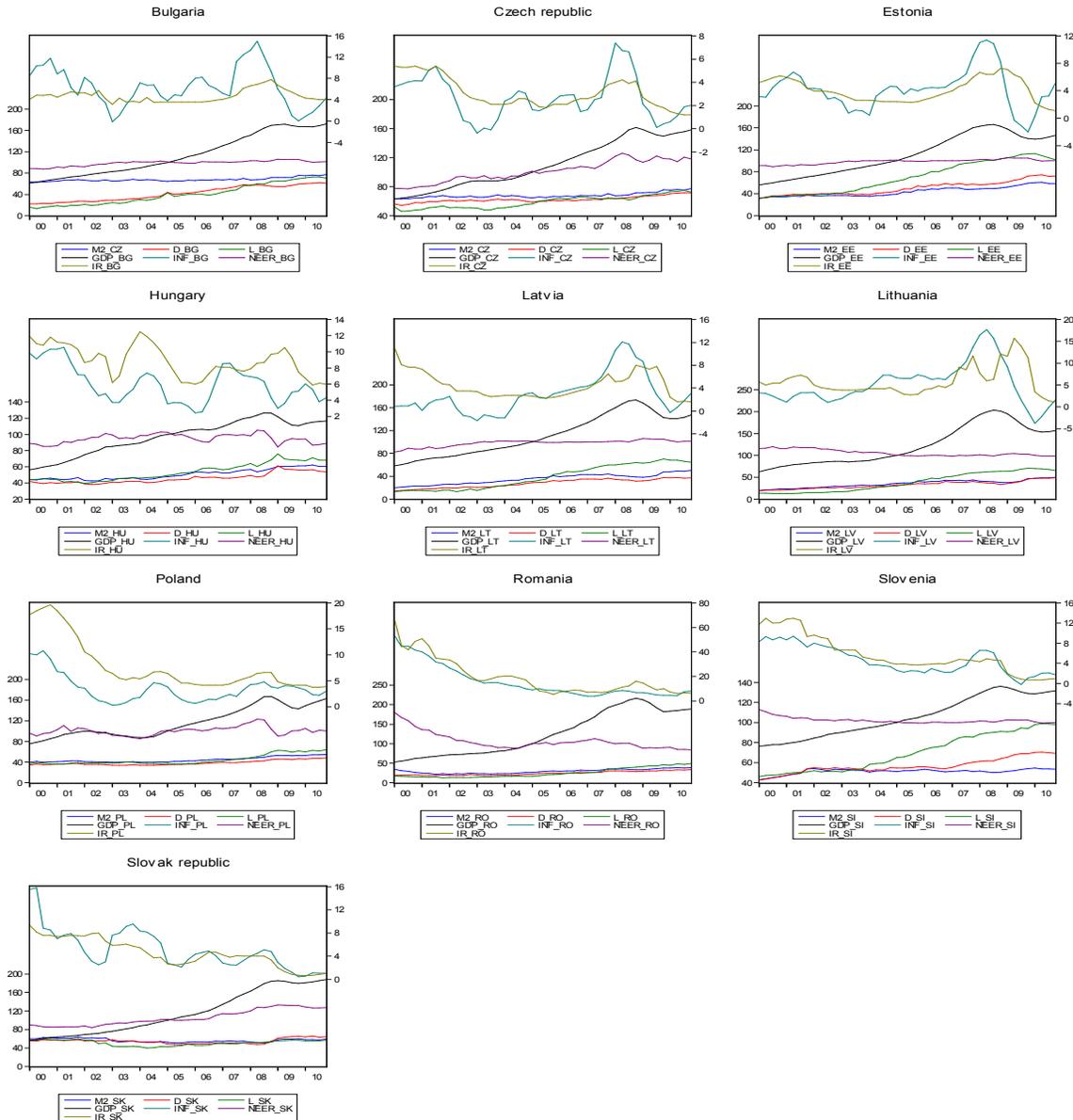


Figure 1. Variables

Note: money stock (M2), domestic deposits (D), domestic loans (L) are expressed as GDP shares (left axis in figures), gross domestic product (GDP), nominal effective exchange rate (NEER) are expressed as indexes (left axis in figures) (2005=100), inflation (INF), interest rates (IR) are expressed in percentage (right axis in figures).
Source: Compiled by author based on data taken from IMF - International Financial Statistics (June 2011).

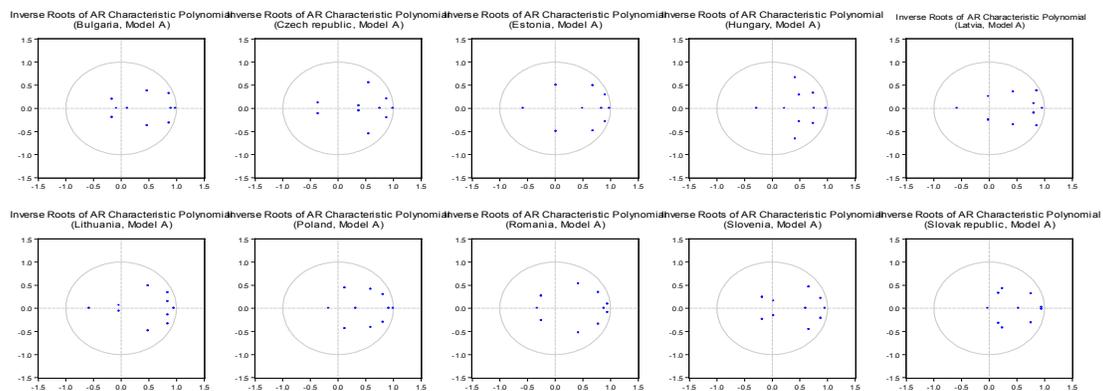
Time series for broad money supply monetary aggregate M2, domestic bank deposits, domestic bank loans and GDP are seasonally adjusted and together with NEER are expressed as indexes with base line year 2005. Core inflation and interest rates are calculated as an annual percentage change of adjusted consumers' price index expressed on the quarterly base.

Before estimating the model we test the time series for stationarity. To determine the order of integration of the variables we use both the augmented Dickey-Fuller (ADF), and the Phillips-Perron (PP) tests. Both tests were computed to test the endogenous variables for the existence of the unit roots. A test designed to determine whether a time series is stable around its levels (trend-stationary) or stable around the differences in its levels (difference-stationary). As we already pointed for VECM it is necessary that all variables included in the model must be non-stationary and have the same order of integration. The augmented Dickey-Fuller (ADF), and the Phillips-Perron (PP) tests were computed to test the endogenous variables for the existence of the unit roots.

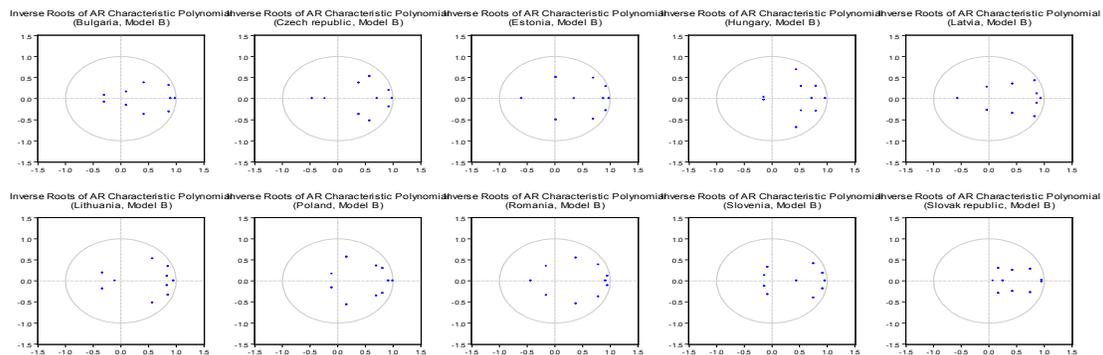
Knowing all the endogenous variables order of integration it is necessary to the test the time series for cointegration using the Johansen cointegration test. The purpose of the cointegration test is to determine whether a group of non-stationary time series are cointegrated or not (following Johansen cointegration procedure in case some endogenous variables are $I(0)$, they must be excluded from cointegration testing). An appropriate lag length for endogenous variables is selected according to the AIC (Akaike Information Criterion) and SIC (Schwarz Information Criterion).

To test the stability of the VEC model we also applied a number of diagnostic tests. We found no evidence of serial correlation, heteroskedasticity and autoregressive conditional heteroskedasticity effect in the disturbances. The model also passed the Jarque-Bera normality test, so that errors seem to be normally distributed. The VEC models seem to be stable also because the inverted roots of the models for each country lie inside the unit circle, although several roots are near unity in absolute value (figure 2).

Model A



Model B



Model C

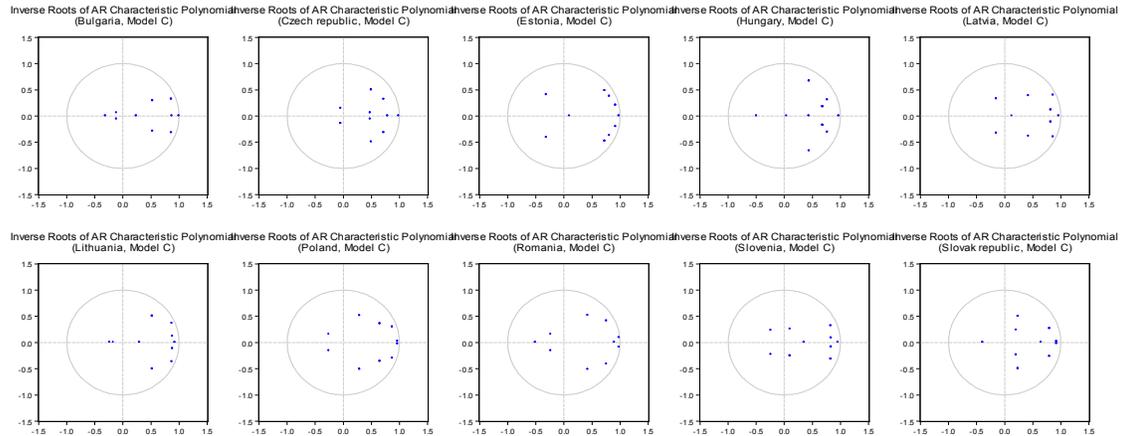


Figure 2. VEC stability condition check

Source: Author’s calculations.

Following the results of the unit root tests and cointegration tests we perform Granger causality test and estimate the model using the variables in the first differences so that we can calculate impulse-response functions (we focus on the responses of real output in the selected group of ETE to the selected financial depth indicators’ one standard deviation in each country. In order to estimate the responses of the real output to the money stock, domestic deposits and domestic loans shocks we estimate following three models for each individual country - model A ($Y_t = [m_b, y_b, p_b, e_b, i_t]$), model B ($Y_t = [d_b, y_b, p_b, e_b, i_t]$) and model C ($Y_t = [l_b, y_b, p_b, e_b, i_t]$) for each of the individual country from the group of ETE.

A. Unit root Test

The results of ADF and PP tests for unit roots presence in the endogenous variables are reported in the Table 1.

Table 1. Tests for Unit Roots

Bulgaria

		M2_BG		D_BG		L_BG		GDP_BG		INF_BG		NEER_BG		IR_BG	
		ADF	PP	ADF	PP	ADF	PP	ADF	ADF	PP	ADF	PP	ADF	PP	ADF
model A	values	-0.962	-0.987					0.516	0.785	-1.114	-1.768	-0.437	-0.664	-0.962	-1.326
	1.dif.	-6.584*	-6.618*					3.878**	3.376**	4.886*	5.270*	4.879*	5.043*	5.765*	5.995*
model B	values			-0.755	-0.486			0.516	0.785	-1.114	-1.768	-0.437	-0.664	-0.962	-1.326
	1.dif.			0.606*	0.562*			3.878**	3.376**	4.886*	5.270*	4.879*	5.043*	5.765*	5.995*
model C	values					-0.239	-0.543	0.516	0.785	-1.114	-1.768	-0.437	-0.664	-0.962	-1.326
	1.dif.					5.774*	0.603*	3.878**	3.376**	4.886*	5.270*	4.879*	5.043*	5.765*	5.995*

Czech Republic

		M2_CZ		D_CZ		L_CZ		GDP_CZ		INF_CZ		NEER_CZ		IR_CZ	
		ADF	PP	ADF	PP	ADF	PP	ADF	ADF	PP	ADF	PP	ADF	PP	ADF
model A	values	-0.596	-0.326					0.217	0.586	-0.781	-0.933	-1.156	-1.061	-2.089	-1.868
	1.dif.	-4.176**	-3.983**					3.718**	3.990*	4.806*	5.095*	5.462*	5.287*	4.299*	4.167**
model B	values			-0.899	-1.177			0.217	0.586	-0.781	-0.933	-1.156	-1.061	-2.089	-1.868
	1.dif.			4.748*	4.905*			3.718**	3.990*	4.806*	5.095*	5.462*	5.287*	4.299*	4.167**
model C	values					-0.165	-0.251	0.217	0.586	-0.781	-0.933	-1.156	-1.061	-2.089	-1.868
	1.dif.					5.017*	5.438*	3.718**	3.990*	4.806*	5.095*	5.462*	5.287*	4.299*	4.167**

Estonia

		M2_EE		D_EE		L_EE		GDP_EE		INF_EE		NEER_EE		IR_EE	
		ADF	PP	ADF	PP	ADF	PP	ADF	ADF	PP	ADF	PP	ADF	PP	ADF
model A	values	-0.785	-0.658					0.289	-0.188	-0.267	-0.471	-1.774	-1.328	-1.771	-1.407
	1.dif.	-	-					4.179*	3.766**	-	-	-	-	-	-
		3.995**	4.780*							4.289*	4.762*	6.919*	6.547*	5.669*	5.117*
model B	values			-1.267	-1.089			0.289	-0.188	-0.267	-0.471	-1.774	-1.328	-1.771	-1.407
	1.dif.			-	-			4.179*	3.766**	-	-	-	-	-	-
				5.173*	4.846*					4.289*	4.762*	6.919*	6.547*	5.669*	5.117*
model C	values					-0.514	-0.388	0.289	-0.188	-0.267	-0.471	-1.774	-1.328	-1.771	-1.407
	1.dif.					-	-	4.179*	3.766**	-	-	-	-	-	-
						4.781*	4.668*			4.289*	4.762*	6.919*	6.547*	5.669*	5.117*

Hungary

		M2_HU		D_HU		L_HU		GDP_HU		INF_HU		NEER_HU		IR_HU	
		ADF	PP	ADF	PP	ADF	PP	ADF	ADF	PP	ADF	PP	ADF	PP	ADF
model A	values	-0.177	-0.375					-0.054	-0.165	-0.686	-0.475	-1.045	-0.655	-0.657	-0.338
	1.dif.	-	-					5.885*	5.914*	5.997*	5.538*	5.886*	5.327*	5.171*	5.053*
		5.107*	5.335*												
model B	values			-0.993	-1.047			-0.054	-0.165	-0.686	-0.475	-1.045	-0.655	-0.657	-0.338
	1.dif.			-	-			5.885*	5.914*	5.997*	5.538*	5.886*	5.327*	5.171*	5.053*
				5.835*	5.991*										
model C	values					-1.268	-0.952	-0.054	-0.165	-0.686	-0.475	-1.045	-0.655	-0.657	-0.338
	1.dif.					-	-	5.885*	5.914*	5.997*	5.538*	5.886*	5.327*	5.171*	5.053*
						4.883*	4.366*								

Latvia

		M2_LT		D_LT		L_LT		GDP_LT		INF_LT		NEER_LT		IR_LT	
		ADF	PP	ADF	PP	ADF	PP	ADF	ADF	PP	ADF	PP	ADF	PP	ADF
model A	values	-0.885	-0.482					-0.773	-0.319	-1.290	-1.118	-0.663	-0.718	-1.003	-0.548
	1.dif.	-	-					5.005*	4.487**	6.252*	6.005*	5.664*	5.295*	4.616*	4.114**
		5.775*	5.117*												
model B	values			-1.226	-0.799			-0.773	-0.319	-1.290	-1.118	-0.663	-0.718	-1.003	-0.548
	1.dif.			-	-			5.005*	4.487**	6.252*	6.005*	5.664*	5.295*	4.616*	4.114**
				4.791*	4.226*										
model C	values					-0.771	-0.665	-0.773	-0.319	-1.290	-1.118	-0.663	-0.718	-1.003	-0.548
	1.dif.					-	-	5.005*	4.487**	6.252*	6.005*	5.664*	5.295*	4.616*	4.114**
						5.279*	5.078*								

Lithuania

		M2_LV		D_LV		L_LV		GDP_LV		INF_LV		NEER_LV		IR_LV	
		ADF	PP	ADF	PP	ADF	PP	ADF	ADF	PP	ADF	PP	ADF	PP	ADF
model A	values	-0.551	-0.843					0.337	0.189	-1.536	-1.114	-0.774	-0.252	-0.881	-0.714
	1.dif.	-	-					4.277*	4.014**	6.381*	6.005*	5.279*	4.881*	5.227*	5.024*
		4.725*	4.915*												
model B	values			-1.377	-1.158			0.337	0.189	-1.536	-1.114	-0.774	-0.252	-0.881	-0.714
	1.dif.			-	-			4.277*	4.014**	6.381*	6.005*	5.279*	4.881*	5.227*	5.024*
				5.003*	4.574*										
model C	values					-0.292	-0.115	0.337	0.189	-1.536	-1.114	-0.774	-0.252	-0.881	-0.714
	1.dif.					-	-	4.277*	4.014**	6.381*	6.005*	5.279*	4.881*	5.227*	5.024*
						4.836*	4.390*								

Poland

		M2_PL		D_PL		L_PL		GDP_PL		INF_PL		NEER_PL		IR_PL	
		ADF	PP	ADF	PP	ADF	PP	ADF	ADF	PP	ADF	PP	ADF	PP	ADF
model A	values	-1.036	-0.712					-0.478	-0.276	-1.025	-1.388	-0.553	-0.870	-0.763	-0.709
	1.dif.	-	-					5.873*	5.489*	6.003*	6.588*	4.857*	4.994*	5.199*	5.443*
		5.652*	5.196*												
model B	values			-0.551	-0.917			-0.478	-0.276	-1.025	-1.388	-0.553	-0.870	-0.763	-0.709
	1.dif.			-	-			5.873*	5.489*	6.003*	6.588*	4.857*	4.994*	5.199*	5.443*
				4.885*	5.338*										
model	values					-0.014	-0.366	-0.478	-0.276	-1.025	-1.388	-0.553	-0.870	-0.763	-0.709

Table 2. Johansen and Juselius cointegration rank tests

Hypothesized No. of CE(s)	Bulgaria						Czech republic					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat
$r=0$	93.238*	53.789*	91.933*	51.758*	93.184*	34.936*	68.566	32.866	69.199	31.491	67.407	31.449
$r\leq 1$	45.341	26.375	43.176	25.680	48.248*	23.477	45.670	26.620	46.707	26.839	45.959	25.109
$r\leq 2$	28.114	15.477	26.495	14.628	24.780	15.964	20.079	12.459	22.869	13.513	20.850	14.598
$r\leq 3$	14.759	13.591	11.868	11.045	8.816	8.503	7.620	6.849	9.356	9.350	6.252	6.098
$r\leq 4$	1.167	1.167	0.822	0.822	0.313	0.312	0.771	0.771	0.006	0.006	0.153	0.153

Hypothesized No. of CE(s)	Estonia						Hungary					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat										
$r=0$	103.296*	51.718*	105.391*	42.767*	96.066*	44.847*	82.397*	33.727	88.117*	32.969	98.345*	30.866
$r\leq 1$	51.579*	23.123	52.624*	26.937	44.219	24.100	44.670	27.217	43.148	23.326	46.479	25.696
$r\leq 2$	28.455	16.736	27.686	20.664	25.119	21.496	21.452	10.635	19.822	11.569	26.783	20.085
$r\leq 3$	11.718	10.482	14.022	12.991	12.623	9.692	10.817	9.568	8.253	7.471	6.698	5.938
$r\leq 4$	1.236	1.236	1.032	1.032	1.003	1.003	1.249	1.249	0.783	0.783	0.760	0.760

Hypothesized No. of CE(s)	Latvia						Lithuania					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat										
$r=0$	94.267*	32.323	107.017*	31.450	96.436*	31.910	110.807*	64.999*	117.206*	47.815*	92.492*	29.718
$r\leq 1$	45.943	25.347	46.566	26.019	44.526	25.893	55.809*	23.926	59.391*	26.411	42.774	24.969
$r\leq 2$	27.596	18.302	27.547	17.841	23.633	14.493	21.882	14.240	22.981	15.821	25.805	16.132
$r\leq 3$	12.294	12.384	13.494	13.023	10.140	13.283	7.642	5.885	7.160	5.961	13.799	10.189
$r\leq 4$	1.910	1.910	1.682	1.682	1.856	1.856	1.757	1.757	1.199	1.199	2.611	2.611

Hypothesized No. of CE(s)	Poland						Romania					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat										
$r=0$	113.585*	32.506	67.820	31.571	120.551*	36.504*	81.112*	36.116*	82.606*	36.553*	91.181*	36.092*
$r\leq 1$	46.079	23.942	43.249	25.700	70.046*	24.589	44.996	18.578	46.053	23.779	55.089*	27.109
$r\leq 2$	21.137	13.411	24.549	16.042	28.458	19.497	26.418	13.902	22.274	9.138	27.979	16.831
$r\leq 3$	7.726	6.775	8.506	6.407	8.960	8.905	12.516	7.041	13.135	8.620	11.148	6.710
$r\leq 4$	0.951	0.951	2.099	2.099	0.055	0.055	2.475	2.475	2.516	2.516	1.439	1.439

Hypothesized No. of CE(s)	Slovak Republic						Slovenia					
	model A		model B		model C		model A		model B		model C	
	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	max eigvalue stat	trace stat	Max eigvalue stat

$r=0$	84.091*	28.635	85.686*	30.430	67.299	31.137	84.810*	30.324	66.771	31.382	94.329*	37.311*
$r\leq 1$	45.456	23.410	45.256	24.563	46.162	25.978	44.486	23.604	42.389	25.694	45.018	24.003
$r\leq 2$	19.045	11.488	19.693	13.241	18.184	9.531	23.882	15.683	26.695	17.237	27.017	16.179
$r\leq 3$	7.557	7.021	6.452	6.429	8.653	6.169	9.199	8.938	11.458	13.391	13.838	9.297
$r\leq 4$	0.536	0.536	0.022	0.022	2.485	2.485	1.161	1.161	1.066	1.066	1.541	1.541

Note: Data in table represents the results of trace statistics and maximum eigenvalue statistics. Critical values for trace statistics at the 5% level of confidence for $r=0$ is 69.819; for $r\leq 1$ is 47.856; for $r\leq 2$ is 29.797; for $r\leq 3$ is 15.495; for $r\leq 4$ is 3.841. Critical values for maximum eigenvalue statistics at the 5% level of significance for $r=0$ is 33.877; for $r\leq 1$ is 27.584; for $r\leq 2$ is 21.131; for $r\leq 3$ is 14.264; for $r\leq 4$ is 3.841.

Source: Author’s calculations.

Both trace statistics and maximum eigenvalue statistics (both at 0.05 level) clearly indicate the presence of unique cointegrating vector in Bulgaria (for model A, B, C), Estonia (for model A, B, C), Lithuania (for model A, B), Poland (for model C), Romania (for model A, B, C) and Slovenia (for model C). Mixed results of cointegration analyses indicate both tests in Hungary (for model A, B, C), Latvia (for model A, B, C), Lithuania (for model C) Poland (for model A), Slovak republic (for model A, B) and Slovenia (for model A). In these countries one test statistics indicate the presence of unique cointegrating equation while the other test statistics denotes there is no cointegration among variables. Finally both test statistics indicate no cointegration among the endogenous variables in the Czech republic (for model A, B, C), Poland (for model B), the Slovak republic (for model C) and Slovenia (for model B). In addition trace statistics indicate two cointegration equations in Estonia (for model A, B), Lithuania (for model A, B), Poland (for model C) and Romania (for model C).

C. Granger Causality Test

To test for evidence of causality between the variables we employ Granger causality test. In a system of variables, a variable is said to be Granger-caused by another, if the second one helps in the prediction of the first one, or equivalently, if the coefficients on the lagged are statistically significant. For example, if two variables are cointegrated, that is, they have a common stochastic trend, and then causality in the Granger (temporal) sense must exist in at least one direction. We say that the first variable does not Granger because the second if the lags of the first variable and the error correction term are jointly not significantly different from zero. Two-way causation is also possible and frequent.

The results of Granger causality tests are shown in table 3.

Table 3. Granger causality tests

Bulgaria

	null hypothesis	lags	obs.	prob.	decision
model A	M2_BG does not Granger Cause GDP_BG	3	41	0.0004	reject
	GDP_BG does not Granger Cause M2_BG	3	41	0.5718	do not reject
model B	D_BG does not Granger Cause GDP_BG	3	41	0.0007	reject
	GDP_BG does not Granger Cause D_BG	3	41	0.5790	do not reject
model C	L_BG does not Granger Cause GDP_BG	3	41	0.2652	do not reject
	GDP_BG does not Granger Cause L_BG	3	41	0.0419	reject

Czech Republic

	null hypothesis	lags	obs.	prob.	decision
model A	M2_CZ does not Granger Cause GDP_CZ	3	41	0.4781	do not reject
	GDP_CZ does not Granger Cause M2_CZ	3	41	0.2546	do not reject
model B	D_CZ does not Granger Cause GDP_CZ	3	41	0.2507	do not reject
	GDP_CZ does not Granger Cause D_CZ	3	41	0.2541	do not reject
model C	L_CZ does not Granger Cause GDP_CZ	3	41	0.2278	do not reject
	GDP_CZ does not Granger Cause L_CZ	3	41	0.4690	do not reject

Estonia

	null hypothesis	lags	obs.	prob.	decision
model A	M2_EE does not Granger Cause GDP_EE	3	41	0.0021	reject
	GDP_EE does not Granger Cause M2_EE	3	41	0.2444	do not reject
model B	D_EE does not Granger Cause GDP_EE	3	41	0.0040	reject
	GDP_EE does not Granger Cause D_EE	3	41	0.5622	do not reject
model C	L_EE does not Granger Cause GDP_EE	3	41	0.0005	reject
	GDP_EE does not Granger Cause L_EE	3	41	0.4906	do not reject

Hungary

	null hypothesis	lags	obs.	prob.	decision
model A	M2_HU does not Granger Cause GDP_HU	3	41	0.2175	do not reject
	GDP_HU does not Granger Cause M2_HU	3	41	0.4401	do not reject
model B	D_HU does not Granger Cause GDP_HU	3	41	0.1919	do not reject
	GDP_HU does not Granger Cause D_HU	3	41	0.2004	do not reject
model C	L_HU does not Granger Cause GDP_HU	3	41	0.4451	do not reject
	GDP_HU does not Granger Cause L_HU	3	41	0.2072	do not reject

Latvia

	null hypothesis	lags	obs.	prob.	decision
model A	M2_LT does not Granger Cause GDP_LT	3	41	0.0010	reject
	GDP_LT does not Granger Cause M2_LT	3	41	0.4742	do not reject
model B	D_LT does not Granger Cause GDP_LT	3	41	0.0005	reject
	GDP_LT does not Granger Cause D_LT	3	41	0.2747	do not reject
model C	L_LT does not Granger Cause GDP_LT	3	41	0.0120	reject
	GDP_LT does not Granger Cause L_LT	3	41	0.4099	do not reject

Lithuania

	null hypothesis	lags	obs.	prob.	decision
model A	M2_LV does not Granger Cause GDP_LV	3	41	0.0005	reject
	GDP_LV does not Granger Cause M2_LV	3	41	0.0129	reject
model B	D_LV does not Granger Cause GDP_LV	3	41	0.0007	reject
	GDP_LV does not Granger Cause D_LV	3	41	0.1940	do not reject
model C	L_LV does not Granger Cause GDP_LV	3	41	0.0007	reject
	GDP_LV does not Granger Cause L_LV	3	41	0.5107	do not reject

Poland

	null hypothesis	lags	obs.	prob.	decision
model A	M2_PL does not Granger Cause GDP_PL	3	41	0.6762	do not reject
	GDP_PL does not Granger Cause M2_PL	3	41	0.0060	reject
model B	D_PL does not Granger Cause GDP_PL	3	41	0.8100	do not reject
	GDP_PL does not Granger Cause D_PL	3	41	0.3627	do not reject
model C	L_PL does not Granger Cause GDP_PL	3	41	0.0193	reject
	GDP_PL does not Granger Cause L_PL	3	41	0.3254	do not reject

Romania

	null hypothesis	lags	obs.	prob.	decision
model A	M2_RO does not Granger Cause GDP_RO	3	41	0.0306	reject
	GDP_RO does not Granger Cause M2_RO	3	41	0.2979	do not reject

model B	D_RO does not Granger Cause GDP_RO	3	41	0.0168	reject
	GDP_RO does not Granger Cause D_RO	3	41	0.6066	do not reject
model C	L_RO does not Granger Cause GDP_RO	3	41	0.0080	reject
	GDP_RO does not Granger Cause L_RO	3	41	0.5669	do not reject

Slovak Republic

	null hypothesis	lags	obs.	prob.	decision
model A	M2_SK does not Granger Cause GDP_SK	3	41	0.4900	do not reject
	GDP_SK does not Granger Cause M2_SK	3	41	0.4795	do not reject
model B	D_SK does not Granger Cause GDP_SK	3	41	0.3607	do not reject
	GDP_SK does not Granger Cause D_SK	3	41	0.5193	do not reject
model C	L_SK does not Granger Cause GDP_SK	3	41	0.3309	do not reject
	GDP_SK does not Granger Cause L_SK	3	41	0.3247	do not reject

Slovenia

	null hypothesis	lags	obs.	prob.	decision
model A	M2_SI does not Granger Cause GDP_SI	3	41	0.9650	do not reject
	GDP_SI does not Granger Cause M2_SI	3	41	0.3700	do not reject
model B	D_SI does not Granger Cause GDP_SI	3	41	0.2835	do not reject
	GDP_SI does not Granger Cause D_SI	3	41	0.2562	do not reject
model C	L_SI does not Granger Cause GDP_SI	3	41	0.0347	reject
	GDP_SI does not Granger Cause L_SI	3	41	0.4842	do not reject

Source: Author's calculations.

Granger causality test results almost precisely follow the results of Johansen cointegration test. Expected long-run causality between all three financial depth indicators and economic growth was confirmed in Estonia, Latvia and Romania only. It seems money stock, domestic deposits and domestic loans granger cause economic growth so that economic development in these countries seems to be causally dependent of financial deepening. As Latvia and Romania are among four countries with lowest GDP per capita from all ten ETE, it seems the financial deepening stimulates economic growth especially in less developed countries.

On the other hand no causality between financial depth indicators and real output was detected in the Czech Republic, Hungary, Slovak republic. Even though Poland is not included in these group of countries it seems financial deepening is not directly responsible for economic growth in the long-run in most developed ETE (here again according to the GDP per capita) we've included in the test.

Finally, mixed results from Granger causality test were obtained in Bulgaria, Lithuania, Poland and Slovenia. In Bulgaria Granger causality test indicate money stock and domestic deposits foster economic growth. Surprisingly, while domestic loans don't granger cause economic growth, causality between these two variables seems to be present in opposite direction, so that economic growth causes domestic loans to growth. This observation might be explained the way economic growth simply stimulates demand for new loans as the real economic activity accelerate investment demand. While domestic deposits and domestic loans seem to affect real economic activity in Lithuania in the long run, Granger causality test doesn't indicate that real economic activity is determined by money stock causation. Quite interesting results were obtained from the results of Granger causality test in Poland. While money stock doesn't seem to granger cause economic growth, causality between these two variables was observed in opposite direction. It might be explained similar way as in case of Bulgaria that is to say real output determined investment demand and/or long-run consumption. At the same time no causality was observed between domestic loans and real output (in both directions). Finally, domestic loans seem to granger cause real output in Poland. While causality between domestic loans and real economic activity were also present in Slovenia, money stocks as well as domestic deposits don't seem to granger cause real output in this country.

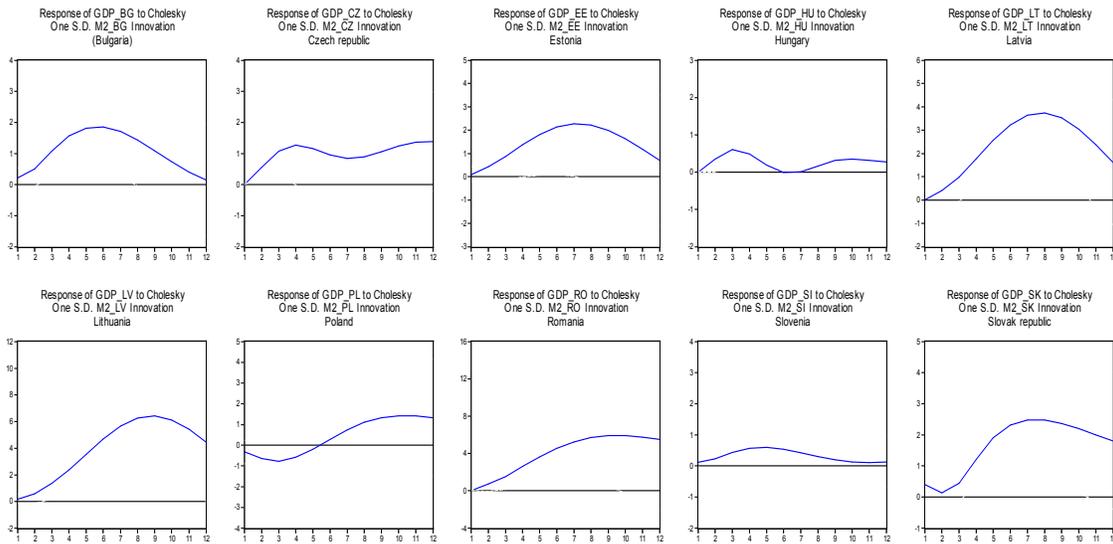
To summarize estimated per country results we may conclude the causality between economic growth and financial depth indicators doesn't seem to be clear for the whole group of ETE.

D. Impulse-Response Function

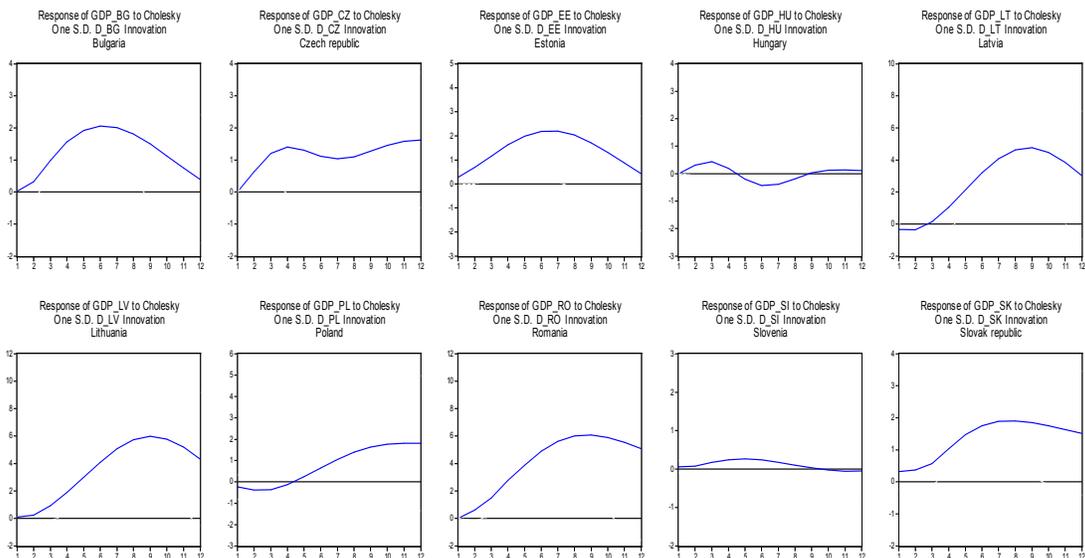
Responses of real output to the Cholesky financial depth indicators' one standard deviation shocks in the selected group of ETE are depicted in the figure 3. While Granger causality test estimates long-run causality among variables of the model, impulse-response analysis outlines responses of the endogenous variables to the shocks hitting the model in the short-run.

Figure 3. Impulse-response functions

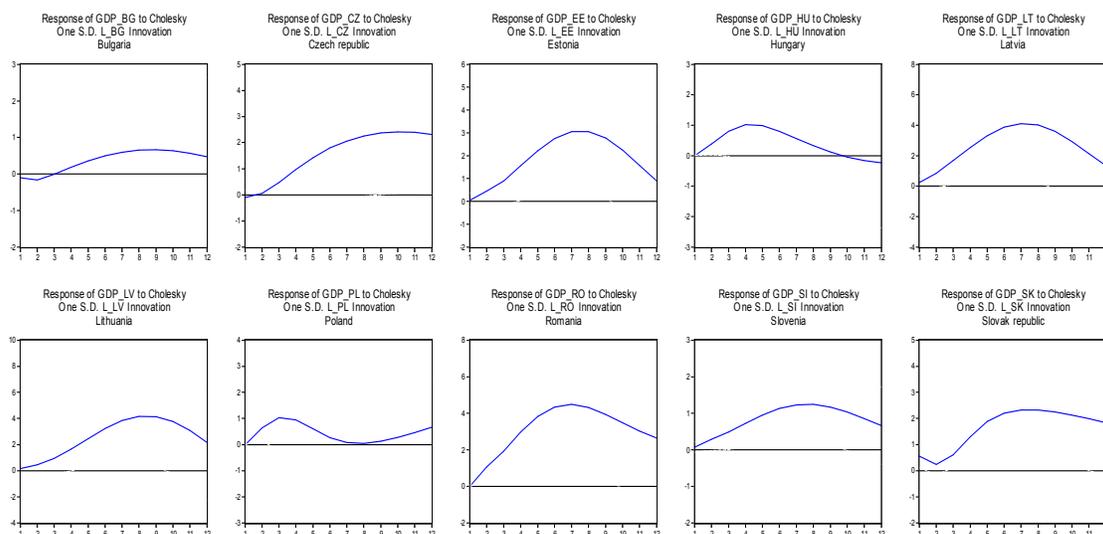
Model A - responses of GDP in ETE to one S.D. shock of money stock



Model B - responses of GDP in ETE to one S.D. shock of domestic deposits



Model C - responses of GDP in ETE to one S.D. shock of domestic loans



Source: Author's calculations.

As we expected one standard deviation shocks from the financial depth indicators determined real economic activity in all ETE in the short-run only though the time they needed to die out differs significantly among countries. Similarly, the results seem to be different when we focus on the initial response as well as overall intensity during the period while the one standard deviation shocks of financial depth indicators affected real output.

From the impulse-response analysis of money stock shock we may conclude that a response of real output to the one standard deviation shock of money stock reached its peak within ten quarters after the shock in all ETE. In all countries but Poland (and partially in the Slovak republic) immediate real output response to this shock was positive. The longest durability of positive effect of money stock shock to real output we observed in Lithuania, Romania and the Slovak republic.

Responses of real output to one standard deviation shock of domestic deposits indicate quite uncertain results in Hungary and Slovenia. The longest durability of domestic deposits shock was observed in the Czech Republic, Romania and the Slovak Republic. Real output responded to the domestic deposits shock with one year lag in Poland. This finding is quite similar to the finding we observed in this country in case of money stock shock. Finally, one standard deviation shock of domestic loans clearly increased real output in all countries from the group of ETE. The longest durability of domestic loans shocks was observed in the Czech Republic and the Slovak Republic. We found that real output in Bulgaria increased apparently lesser in comparison with two previous shocks. At the same time the shock of domestic loans increased real output with quite higher intensity in Hungary and Slovenia in comparison with money stock and domestic deposits shocks.

5. Conclusion

In the paper we have analyze the main aspects of the financial deepening in ten ETE in the period 2000-2010 using vector error correction model (VECM). We have implemented a multivariate cointegration methodology to estimate the relationships between financial depth indicators and real output in the selected group of countries. ADF and PP tests were implemented to find the order of integration of endogenous variables. To determine the rank of cointegration we have followed a Johansen cointegration procedure to calculate the trace test and maximum eigenvalue test. We have also tested the direction of the causality relationships between financial depth indicators and real output using linear Granger causality test. Using the estimated VEC model, the dynamic responses of the endogenous variables to the money stock, domestic bank deposits and domestic bank loans one standard deviation shocks were computed for each country from the group of ETE.

Comparing the result for each country from the group of ETE we may summarize our findings as follows: (1) Especially countries with lower GDP per capita seem to benefit from financial deepening as the financial deepening indicators affects real economic activity with higher intensity in the short-run and Granger cause real output in the long-run; (2) While short-run effects of financial depth indicators' shocks on the real output development differs in intensity, durability as well as in initial response, overall positive impact is almost clear in all ETE.

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References

- [1] Abu-Bader, S., Abu-Qarn, A.S. 2006. Financial Development and Economic Growth Nexus: Time Series Evidence from Middle Eastern and North African Countries, Monaster Center for Economic Research's Discussion Paper No. 06-09, 34p.
- [2] Al-Yousif, Y.K. 2002. Financial development and economic growth: Another look at the evidence from developing countries. *Review of Financial Economics*, 11:131-150.
- [3] Apergis, N., Fippidis, I., Economidou, C. 2007. Financial Deepening and Economic Growth Linkages: A Panel Data Analysis. *Review of World Economics*, 143(1):179-198.
- [4] Arfaoui, M., Abaoub, E. 2010. On the Determinants of International financial Integration in the Global Business Area. *Journal of Applied Economic Sciences*, 5(3):153-172.
- [5] Baltagi, B.B., Demetriades, P.O., Law, S.H. 2009. Financial development and openness: Evidence from panel data. *Journal of Development Economics*, 89:285-296.
- [6] Calderón, C. 2002. The Direction of Causality between Financial Development and Economic Growth, Central Bank of Chile's Working Paper No. 184, 20 p.
- [7] Christopoulos, D.K., Tsionas, E.G. 2004. Financial development and economic growth: Evidence from panel unit root and cointegration tests. *Journal of Development Economics*, 73:55-74.
- [8] Engle, R.F., Granger, W.J. 1987. Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55(2): 251-276.
- [9] Ezzo, L.J. 2009. Cointegration and causality between financial development and economic growth: Evidence from ECOWAS countries. *European Journal of Economics, Finance and Administrative Sciences*, 16:112-122.
- [10] Geweke, J. 1982. Measurement of Linear Dependence and Feedback between Time Series. *Journal of the American Statistical Association* 79:304-24.
- [11] Ghirmay, T. 2004. Financial development and economic growth in Sub-Saharan African countries: Evidence from time series analysis. *African Development Review*, 16:415-432.
- [12] De Gregorio, J., Guidotti, P.E. 1995. Financial Development and Economic Growth. *World Development*, 23:433-448.
- [13] Johansen, S. 1988. Statistical analysis of cointegrating vectors, *Journal of Economic Dynamic & Control*, 12: 231-254.
- [14] Johansen, S. 1991. Estimation and Hypothesis testing of cointegrating vectors in Gaussian vector autoregressive models. *Econometrica* 59: 1551-80.
- [15] Johansen, S., Juselius, K. 1990. Maximum Likelihood Estimation and Inference on Cointegration -with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics* 52: 169-210.
- [16] Levine, R., Loayza, N., Beck, T. 2000. Financial intermediation and growth: Causality and

- causes. *Journal of Monetary Economics*, 46:31-77.
- [17] Misztal, P. 2010. Foreign Direct Investments, as a Factor of Economic Growth in Romania. *Journal of Advanced Studies in Finance*, 1(1):72-82
- [18] Pradhan, R.P. 2010. Financial Deepening, Foreign Direct Investment and Economic Growth: Are they Cointegrated? *International Journal of Financial Research*, 1(1):37-43.
- [19] Rachdi, H., Mbarek, H.B. 2011. The Causality between Financial Development and Economic Growth: Panel Data Cointegration and GMM System Approaches. *International Journal of Economics and Finance*, 3(1):143-151.
- [20] Vasilescu, G., Popa, A. 2009. Global FDI inflows under the Pressure of Financial Crisis. *Journal of Applied Research in Finance*, 1(2):105-112.
- [21] Yahyaoui, A., Rahmani, A. 2009. Financial development and economic growth: Role of institutional quality. *Panoeconomicus*, 56(3):327-357.

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Call for papers Journal of Applied Research in Finance

Published two times a year, the journal is the official publication of *The European Centre of Managerial and Business Studies*, academic organization devoted to the study and promotion of knowledge about financial economics. The journal has been established in year 2009 as a descendant to *Journal of Applied Economic Sciences* (JAES). Two issues are published per volume. All articles and communications are available online for free. Printed copies can be ordered at a cost. The editors maintain classic *double blind peer review* procedure aiming at high academic standards but at the same time emphasize dynamic referee process so that the journal tracks scientific progress in real time.

Currently, *Journal of Applied Research in Finance* is indexed in EBSCO, CEEOL and IndexCopernicus.

The *Journal of Applied Research in Finance* invites paper submissions on issues related but are not limited to:

- Monetary Economics;
- Money and Interest Rates;
- Monetary Policy, Central Banking, and the Supply of Money and Credit;
- Macroeconomic Aspects of Public Finance;
- International Finance;
- Macroeconomic aspects of Finance;
- General Financial Markets;
- Financial Institutions and Services;
- Corporate Finance and Governance;
- Taxation, Subsidies, and Revenue;
- Fiscal Policies and Behavior of Economic Agents;
- Public Finance;
- Behavioral Finance.

Submissions to *Journal of Applied Research in Finance* are welcome. The paper must be an original unpublished work written in English (consistent British or American), not under consideration by other journals.

Invited manuscripts will be due till November 15, 2011, and shall go through the usual, albeit somewhat expedited, refereeing process.

Schedule

Deadline for Submission of Papers:

15th November 2011

Expected Publication Date:

December 2011 (e-version) – January 2012 (hard-copy)

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AUCO Czech Economic Review



The 660-year-old Charles University in Prague is now undertaking a new publication venture by re-launching a journal *AUCO Czech Economic Review*.

AUCO Czech Economic Review (ISSN 1802-4696) presents original, rigorously peer-reviewed research in economics with solid microeconomic grounds. Coverage includes both theoretical and methodological articles (game theory, mathematical methods in economics) as well as empirical articles (political economy, institutional economics, public economics). AUCO encourages also short communications (usually limited to 2,000 words) that provide an instrument of rapid and efficient dissemination of new results, models and methods in above mentioned fields of economic research. One of the primary purposes is to serve as a common ground for economists and political scientists who explore political economy from a formal perspective (positive political economy, public choice and social choice, political economics). Another goal is to attract key

contributions of gifted European junior economists.

AUCO Czech Economic Review is published by Charles University in Prague. The journal has been established in year 2007 as a descendant to a traditional Czech-written outlet, *Acta Universitatis Carolinae Oeconomica*. Three issues are published per volume. All articles and communications are available online for free. Printed issues can be ordered at a cost. The editors maintain classic **double blind peer review** procedure at high academic standards but at the same time emphasize **dynamic referee process** so that the journal tracks scientific progress in real time. The journal is indexed in EconLit, EBSCO, RePEc, in Czech Government list of reviewed journals, and recently is considered for indexing in Scopus.

Submissions

Submissions to **AUCO Czech Economic Review** are welcome. The paper must be an original unpublished work written in English (consistent British or American), not under consideration by other journals. Instruction for authors is available on journal web-site.

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