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The journal is an international refereed journal published twice a year in June and December. The scientific and intellectual responsibilities belong to the authors.

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BY EDITOR

Dear Colleagues...

I am pleased to present you with the third volume- first issue of the journal of Review of Socio-Economic Perspectives (RSEP). The journal has been completed two and a half years with this issue. In the process, the journal continuing its publishing life with confidence is keeping its resolution and ambition for the future issues.

This issue consists of six articles including wide range of subjects. The first of them is relating to the building human capital via migration . The second is the evaluation about perceptions of bank financing constraints differ among characteristics of SMEs, with example of Turkey. The third is regarding wages and happier upper classes. The fourth, considering the effects of commodity price levels and volatility on growth in a leading commodity export framework. The fifth discusses the natural resource curse with the socioeconomical and sociopolitical analysis. The sixth, on basis of executive managers, argues on measuring value creation for business development.

I would like to thank all authors, the members of editorial board and reviewers for their valuable contributions in publishing this issue. I also would like to invite you to participate in RSEP as author, a reader, reviewer and to help inform your friends, colleagues and circles about this journal.

I sincerely hope that you will enjoy and benefit from reading this publication.

Assoc. Prof. M. Veysel KAYA
Editor
June 2018

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Introduction

This paper deals with anomalies in the economic theory and economic modelling of the modern money economy. The anomalies per se have little to do with the performance of the real world economy, neither the microscopic level nor the macroscopic level. Thus the real world economy is the very one we live in and which we practically and theoretically have to cope with, so eventual anomalies in the confrontation of economic theory with the real world economy must have their roots in the very economic theorizing. Keynes wrote (1973: 383):

> *But apart from this contemporary mood, the ideas of economists and political philosophers, both when they are right and wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic of a few years back.*

We have gone through a trying period in Europe in the aftermath of the sub-prime scandal in 2008. Before that there was a total focus on inflation which was absurd since everybody knows that inflation measures are delivering rather poor figures for analysis and policy-makers and financial market agents reacted not only on occasional percentages but on fractions of percentages measured on yearly basis. In Europe the inflation targets and the policy virtually wiped out growth of the European economies.

The links between growth and inflation are very intricate and the risk of juxtaposition is obvious in economies with changing dimensionality of the commodity space, but no one seemed to pay any attention to this. Furthermore the anti-inflation policy was obviously not sufficient to prevent the subprime crises.

The austerity policy following the subprime scandal has created social instability of a degree which is dangerous for the society and which might threaten further

economic growth and social stability. For the moment we witness an absurd show of central banks trying to create inflation to foster growth thus assuming complete macroscopic reversibility.

The basic thinking behind these social experiments has mainly been based on the neoclassical theory/thinking, a theory which bases its impressing mathematical superstructure on a fairly simple analysis of barter economy best expressed in a medieval village, and its very construction builds on a belief that economic analysis can be performed without regards to the

surrounding social, cultural and ethical structures. Luigi Amoroso (1938) wrote about Wilfred Pareto:

> *It is one of the ironies of life that Vilfredo Pareto, the denier of every creed, of every philosophy, is the artificer who, first and most valiantly, raises-on the ruins of the democratic dogma - the edifice of the new faith and of the new philosophy, anti-democratic, anti-humanitarian, anti-progressive, anti-evolutionary. For, by taking as a foundation the critique of the derivations, that is, of the logical and pseudological reasonings with which the socialist-democratic city justified its deterministic, laical, and international faith, he restored a theoretical value to religious and patriotic values, to the principles of individual responsibility and of the freedom of the will; the principles which the wisdom of the ages has taken as the foundation of all civil life.*

Projections of the World

Economic theorizing mostly uses a mishmash of neoclassical and Keynesian thinking, not necessarily wrong per se in practical work, but the most serious effect sare that Keynes' basic philosophical thinking is completely overlooked and even so called Keynesians accept the neoclassical approach to modelling, also with

respect to money, which indeed is curious since money in everyday sense is anomalous to the neoclassical theory in its axiomatic form.

Little efforts have been made to link Keynes' philosophical approach, which starts from the distinction between atomic and complex variables, to his economic thinking. In doing so we end up in the conclusion that Keynes' thinking and the neoclassical theory are contradictive in terms.

Scientific theories are projections of a multidimensional problem into a theoretical world of less dimensions.

The ancient Greek artist had a fabulous perception and apprehension of the human body and geometrical forms which was used for wonderful sculptures and buildings. However their ability to project the human body as well as nature at large onto a two-dimensional surface was poor. The Euclidian geometry was the theoretical basis for analysing the reality but through the axiom of parallels not even geometers were able to even understand projections of three dimensional objects into two-dimensional paintings.

The break-through came during the Italian Renaissance, it was an architect Filipo Brunelleschi (1377-1446) who developed the geometrical technique. It was however two artists, two of the giants of art Van Eyck (1390-1441) in Flanders and Andrea Mantegna (1431-1506) in Padua/Mantua who realized the principles of projecting three-dimensional motives on two dimensional surfaces in expressive art. Thus the leading personages in the development of projective theory were not mathematicians but architect and artists.

It had to pass some three-hundred years more until mathematicians produced the full theory of non-Euclidian geometry and projections. The two persons actually doing it were Nikolai Lobachevsky in his paper from 1826 "A concise outline of the foundation of geometry", and Janos Bolyai 1823 in a letter to his father, published 1832, "Appendix Scientiam Spatii Absolute Veram Exhibens", developed a non-Euclidian consistent geometry, dismissing the Euclidian axiom of parallels.

It is interesting to see that those actually working in practise with projections of the real world since long had anticipated the problems with the Euclidian axiom of parallels while it took a considerably longer time to understand the very axiomatic problem. Lobashevsky/Bolyai decided to do completely without the axiom of parallels and replace it with: *For any infinite straight line L and any point P not in it, there are many other infinitely extending straight Lines that pass through P and which do not intersect with L.* The simplest way to imagine this proposition is to think of a sphere projected on a two-dimensional surface.

The problem underlying these peculiarities does not however stem from the axiom of parallels per se but basically from Euclid's definition of a *Point* leading to a line where many points are closely succeeding each other. A *Point* is obviously undefined with respect to dimensionality[1]. Concerning projection it is important to realize that such an operation requires inert structures.

The postulate by Lobashevsky/Bolyai was developed by particularly Riemann into the modern curved space theory. Riemann's analysis started a veritable rush with respect to the study of the spatial conditions of the world and geometry was developed into topology, Hilbert, Aleksandroff, Hopf from the beginning of 20th century were key figures in mathematics. The mathematical analysis was accompanied by systematic studies of biological forms particularly comprehended and expressed by d'Arcy-Thompson. The development of new areas of mathematics were adumbrated by the developments of analytical philosophy particularly in the works of Russell/Whitehead, Wittgenstein, Reichenbach and the man of certain interests to us economists, John Maynard Keynes.

Our introduction alluding to geometrical matters perhaps seems a bit esoteric but in fact they are fundamental to understand Keynes' philosophical view. He announces it clearly in General Theory where he actually says (1936[1973]:16-17):

[1]A compact and precise discussion of this can be found in Paul Alexandroff (1932/1961 in English)

> *The classical economists resemble Euclidian geometers in a non-Euclidian world who, discovering that in experience straight lines apparently parallel often meet, rebuke for the unfortunate collisions which are occurring. Yet, in truth, there is no remedy except to throw over the axiom of parallels and to work out a non-Euclidian geometry. Something similar is required to-day in economics. We need to throw over the second postulate of the classical doctrine and to work out the behaviour of a system in which involuntary unemployment in the strict sense is possible.*

Keynes is certainly right in relating to involuntary unemployment but from our point of view his philosophical discussion of atomic and complex variables is the more fundamental if we want to study the neoclassical axiomatic structure per se and uncover hidden contradictions.

We have now reached the very start of our analysis. Two types of problems were frequently discussed in Cambridge at the time when Keynes became a student there: i) additive aggregation and ii) atomic versus complex variables. Both these problems will be of utmost importance in projecting empirically apprehended structures into mathematical/logical models.

If we look at John Maynard Keynes he discusses both these problems in his early philosophical works and particularly atomic versus complex variables in his "Treatise on Probability".

In a speech delivered to the Apostles 1903 at the age of twenty Keynes claimed with respect to additive aggregation:[2]

[2]I am grateful to Lord Robert Skidelsky, Emeritus Professor at Univ. of Warwick, for interesting discussion on Keynes philosophical contributions and his kind help in sending me a draft from the early lecture notes by Keynes (1903) where Keynes rejects additive aggregation. The Apostles was a secret intellectual society in Cambridge.

> *...the unpopularity of the principle of organic unities shows very clearly how great is the danger of the assumption of unproved additive formulas. The fallacy, of which ignorance of organic unity is a particular instance, may perhaps be mathematically represented thus: suppose f(x) is the goodness of x and f(y). It is then assumed that the goodness of x and y together is f(x)+f(y) when it is clearly f (x+y) and only in special cases will it be true that f(x+y) = f(x)+ f(y). It is plain that it is never legitimate to assume this property in the case of any given function without proof.*

Additive aggregation is a risky affair in empirical sciences and particularly in applying mathematics/statistics to empirical problems in naive ways.

For those reading Keynes carefully it is fully evident that he follows his own statement and reject sexplicitly or implicitly additive aggregation but for clearly defined problems.

The neoclassical theory however explicitly *postulates* additive aggregation. Thus it is, from a mathematical point of view, not possible to mould Keynes' writings into a neoclassical form: *Keynes' approach to economics and the neoclassical theory contradict each other in terms.*

Projections of Real World into Mathematics

We have always to translate an analysed piece of reality into a kind of projection suitable to logical analysis. The projection of a certain space into a space of less dimensions raises two principle problems. The first has to do with the very choice of dimensions which we choose, the second has to do with precise mathematical form of the variables we prefer to deal with. These two can be named as the *translation problem*.

Wittgenstein's formulates a proposition 6.211 in Tractatus Logico-Philosopicus:

> *Indeed in real life a mathematical proposition is never what we want. Rather, we make use of mathematical propositions only in inferences from propositions that do not belong to mathematics to others that likewise do not belong to mathematics. (In philosophy the question, "What do we actually use this word or this proposition for?" repeatedly leads to valuable insights.)*

We may illustrate it like in **Figure 1** and we see one distinct problem namely that the causal structures of the reality are almost always irreversible while logical/mathematical structures are almost always reversible.

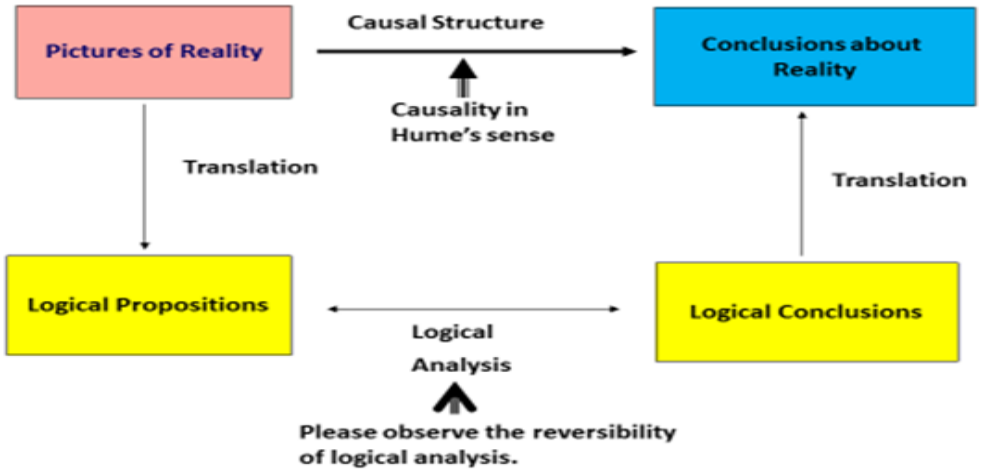

Figure 1: Illustration of Proposition 6.211

The neoclassical axiomatic structure has as a corollary the so called *principle of revealed preferences*, which means that given general equilibrium the optimization problem of maximizing utility given prices and incomes can be replaced by minimizing costs given utility. This correlate utilizes the very feature of

reversibility in mathematics/logics without any reference to the real world.[3] The essential role of this correlate is that it has to be believed in if we work with the usual inflation indices.

However the problem of projections has also a deeper philosophical aspect which becomes apparent in the difference between Immanuel Kant and David Hume and the difference between a claimed ideal world and a sensual perceivable worlds. Kant made a distinction between "Das Ding an sich" and "Das Ding für sich" where the former was the correct and un-perturbed representation of objects of the real world while the second was the perturbed representation we achieve through our senses and interpretations of mind based upon that picture. Based on this view, and by all means other considerations, Kant came to the conclusion that the mathematical representation would be an unperturbed picture of both the object and its relations to other objects. Kant's philosophy has had an enormous impact on our thinking for good and worse but with respect to our discussions of projections and interpretations of reality he seems a bit naïve not to say obsolete.

Hume, on the other hand who with his investigations on causality is fully up to the analytical philosophy of our time, has a contradictive view in relation to Kant, since he only discuss the sensual perceivable world. He looks at reason/logics/mathematics as humble servants of passion. Thus he points towards the conclusions of Cantor/ Russell/ Whitehead/ Wittgenstein/ Gödel that the logics/mathematics is empty of any real content, it is a language which at best might be consistent but that is unprovable (Gödel). There is a famous quote from Hume:

> *Nothing is more usual in philosophy, and even in common life , than to talk of the combat of passion and reason, to give the preference to reason, and assert that men are only so far virtuous as they conform*

[3] This result is often a bit embarrassing to economic theorists and Georgescu-Roegen rejected it for dynamic analysis, in the 1930s, while Samuelson tried to explain it and give it an empirical meaning in late 1940s.

> *themselves to its dictates. .... I shall endeavour to prove first that reason alone can never be a motive to any action of the will; and secondly that it can never oppose passion in the direction of the will. (Hume, 2002[1740]: 265)*

Hume uses passion in a fairly broad way meaning interests, preferences, purposes, will in a broad sense.

Thus if we follow Hume as well as modern analytical philosophy a mathematical analysis of certain features of the reality can be consistent without being true. Our example above with respect to the increased quality of apprehension and ability of projections of the physical space shows that the theory of projecting the world was not an à priori construction but the skilfulness of some talented architects and artists and their sensual perception combined with a masterful ability of expressing themselves in drawings and paintings and *then* we got the mathematical/logical development.

Moreover Picture 1 and the quote from Wittgenstein implies that the very logical analysis per se is the most trivial part of the analytical procedure. How we actually form our axiomatic projection of the reality is the question of overwhelming importance and that is what this paper is about concerning the mainstream economics and its relation to the neoclassical theory.
Thus a mathematical picture is, should and can be nothing but an interpretation of sensual apprehensions in empirical science.

Models and Reality

When we read economic thinkers up to the second part of the 19th century economic theoreticians were fully occupied with analysing the peculiarities of the *money economy*. Jean Baptiste Say, who has come to symbolize the neoclassical general equilibrium through his putative law, actually explicitly rejected the

existence of a general equilibrium by rejecting any form of prices and money as a general measure in economic science.[4]

However from the 1860s/70s economic analysis took another path, instead of working with an open system of the economic world the analysis became closed in trying to reach some form of parallel to Newton's physical equilibrium system. This was achieved by introducing the concept of *utility* which was an abstract concept, a common "substance" to all commodities.

Rationality was also explicitly imputed in the analysis, and its links to the Kantian analysis is obvious. If we look at Hume and the philosophical and mathematical development during the 20th century the word rationality used in the economic analysis during the end of the 19th century is indeed naïve. In mathematics/logic rationality/reason per se is empty of any empirical content. Thus applying the word rationality implies that we also must reveal an empirical structure onto which the word rationality can be utilized.

Basically the concept of rationality must be based on a common measure. It is thus instructive to read Jean Baptiste Say who rejected prices as well as money as any kind of general measure. Thus Say only saw an equilibrium price as a local and temporal phenomenon. He has a brilliant example to illustrate this:

> *When I am told that the great pyramid of Ghaize is 656 feet square at the base, I can measure a space of 656 feet square at Paris or elsewhere, and form an exact notion of the space the pyramid will cover; but when I am told that a camel is at Cairo worth 50 sequins, that is to say, about 90 ounces of silver, or 100 dollars in coin, I can form no precise notion of the value of the camel; because, although I may have every reason to believe that 100 dollars are worth less at Paris than at Cairo, I can not tell what may be the difference of value.* Say (1834[1803]: 247)

[4] A more comprehensive discussion of Say is found in Ekstedt (2012: 54-57). "Say's Law" originately appears in Say (1802): Chapter XV.

And he states:

> *Money or specie has with more plausibility, but in reality with no better ground for truth, been pronounced to be a measure of value. Value may be estimated in the way of price; but it can not be measured, that is to say, compared with a known and invariable measure of intensity, for no such measure has yet been discovered* (Say 1834[1803]:246).

A meter is defined as the distance which light covers in vacuum during $\frac{1}{299\,792\,458}$ second, which obviously has to be seen as a local and temporal earthly business. However this medium of measure is defined from the inert reality which scientists agree on because of its observability.

The measure in the neoclassical axiomatic structure called a price-vector, which has nothing to do with prices in everyday sense, is only defined in a general equilibrium in an economy with constant dimensionality of the commodity space.

That brings us to a passage in a famous letter from John Maynard Keynes to Roy Harrod 10th of July 1938 (Keynes: Collected Works):

> *My point against Tinbergen is a different one. In chemistry and physics and other natural sciences the object of experiment is to fill in the actual values of the various quantities and factors appearing in an equation or a formula; and the work when done is once and for all. In economics that is not the case, and to convert a model into a quantitative formula is to destroy its usefulness as an instrument of thought. Tinbergen endeavors to work out the variable quantities in a particular case, or perhaps in the average of several particular cases, and he then suggests that the quantitative formula so obtained has general validity. Yet in fact, by filling in figures, which one can be quite sure will not apply next time, so far from increasing the value of his instrument, he has destroyed it. All the statisticians tend that way. Colin, for example, has recently*

> *persuaded himself that the propensity to consume in terms of money is constant at all phases of the credit cycle. He works out a figure for it and proposes to predict by using the result, regardless of the fact that his own investigations clearly show that it is not constant, in addition to the strong a priori reasons for regarding it as most unlikely that it can be so.*

These are remarkable words if we just look at them in the current mode of economic modelling but they are based on Keynes' early philosophical works and are in the line of the development of analytical philosophy during the 20th century concerning the emptiness of logic with respect to real content.

It may also explain a rather curious exchange of thoughts at Salvatore Dali's place in Figures, north of Barcelona, November 1985 when the Nobel laureate in chemistry Ilya Prigogine met René Thom, the great French mathematician, in a public discussion:

> *Thom: You should very carefully distinguish between what belongs to mathematical theory and what belongs to real systems. Mathematics has nothing to say to reality.*
>
> *Prigogine: That's your point of view, it's not mine*

René Thom seems to be right in the very fundamental sense that mathematics is a language and as such neutral to the substance of the analysis. Furthermore mathematics has almost always to work with atomistic variables while in reality such variables almost never exist.

Prigogine may also be right, but then we think more about abstract geometric and topological forms analysed in mathematics which allow us to analyse different complex *mathematical* structures with logical precision and that may give rise to fruitful inventions of new perspectives in empirical sciences.[5]

[5]The discussion is partly available at www.dalidimension.com

When we enter mathematics the variables are expected to be defined in an atomistic way and that has to be observed carefully. In fact most of the natural sciences, physics, chemistry and medicine use their laboratory experiments almost solely for the reason to find a precise variable with one and only one definition. In such a way these sciences might approach a set of almost atomic variables, and the repetitiveness is to establish an inert parametric structure. As Keynes points out this is not possible in social sciences and consequently there is no truth value of a certain parametric solution but for the actual mathematical/statistical operation. True that convincing argumentation of an inert structure may persuade us *to attach some relevance to a parametric structure as such but not to the parametric values*.

Equilibrium – Disequilibrium

The turn to a mathematical treatment of equilibrium became more or less completed when the utility theory entered in a systematic form and we got a closed relationship between the individuals and the commodities. It is very interesting to compare Mill's and Jevons' writings leading to Jevons' mathematical formulation of a utility function for the individual. Mill strived towards a complete macroscopic formulation but had difficulties to get around the interrelations between individuals; his discussion actually points toward Arrow's paradox in some aspects (Mill 1990[1863]). Jevons realized these difficulties and defined utilities as well as individuals in atomistic terms and thus directly dismissed the parts which troubled Mill and could consequently find a way of representing the relation between the outer market supply and the interior of the individual given the *rational* individual.

The result was a rift between the mathematical representation of the macroscopic vis-à-vis the microscopic economics.

The fully logically consistent representation of an economy populated with "rational" individuals was shaped during the period 1930s to 60s and reached an axiomatic form in Arrow& Debreu (1954), and in Debreu (1982) the equivalence between Nash-equilibrium and Arrow-Debreu competitive equilibrium was shown, which was the ultimate step in the completion of the neoclassical theory.

It is worthwhile to notice that the theory often is used inter-temporally and this actually seems in line with Jevons although not expressed explicitly. To the author it seems that the only ranking economist who explicitly *rejects* this is Gerard Debreu; we will come back to this later.

Disequilibrium approaches are more difficult to get hold of. It contains Keynesianism, institutionalism, evolutionary economics and several other approaches that often build on analogies to other sciences as neurology, biology, and may be others. This is natural since contrary to equilibrium theory there are no unifying models for economic affairs only local and temporal, social, political and cultural forces.

The equilibrium model has a most sophisticated mathematical form and thus seems to be the theory *par preference*. The neoclassical general equilibrium means on one hand that the price vector for the defined commodity space is unique, given the distribution of initial distribution of commodities and/or productive resources. This means that the agents maximize their utilities/welfare given initial *endowments.* In early days these were regarded as a stock of commodities of different kind but in Makarov & Rubinov (1977) we got the final link between the Neumann-Gale production analysis and the Arrow/Debreu equilibrium; thus we could replace (within the taken presumptions) commodities with productive resources.

Consequently the neoclassical equilibrium theory has been developed to cover not only individual optimizing but a social optimum, which also achieves the highest form of distributive efficiency, Pareto efficiency. The market process is subsequently neutral with respect to distribution. It is obvious that such an approach seems tasteful both from a scientific as well as an ideological/ethical point of view.

With respect to ethics we implicitly can identify two opposite states; both build on the facts that the individuals act as independent atoms and that in equilibrium unanimously must rule. That means that either we have a state of complete in-deterministic chaos or we have a strict rule for the individual to make all other

individuals' preference functions restrictions for the own behaviour which is rather similar to the Kantian imperative, *'Act externally in such a manner that the free exercise of thy will may be able to coexist with the freedom of all others, according to a universal law'* (Kant 2007[1795]:398).Thus the Kantian imperative is consistent with a Nash-equilibrium, which means that given the distribution of endowments the agents maximize their welfare given the preference relations of all other agents.

Axiomatic Structure

The neoclassical axiomatic structure as in Table 1 has two parts: defining rationality and defining the properties of the preference ordering. There are three axioms in each group:

Table 1: The Neoclassical Axioms of Arrow/Debreu

Economic Rationality	**Properties of the Preference Ordering**
1. Axiom of Completeness *All commodities in the commodity space are known to everybody*	4. Axiom of Continuity
2. Axiom of Reflexivity *All commodities are identical to themselves*	5. Axiom of Convexity
3. Axiom of Transitivity *For any three commodities holds that if* $xRy \wedge yRz \Rightarrow xRz$	6. Axiom of Local Non-satiation *for any commodity basket A there exists at least one commodity* x_i *such that* $A(x_1,\text{---}, x_i+\varepsilon, \text{---}, x_n) \succ A(x_1,\text{---}, x_i, \text{---}, x_n)$

The 6th axiom replaces the obsolete marginal decreasing utility hypothesis.
From a mathematical point of view one might raise an (or even both) eyebrow because the axioms 1 to 6 actually define an ordered Euclidian space. The implication of the axioms is that the commodity space is seen as a Euclidian space where the *n* commodities are the dimensions respectively, and consequently the *m* agents are represented by n-dimensional vectors. This implies that neoclassical

aggregation is actually a simple vector addition. Given a certain moment we may assume that all preferences are fixed. If we then impute a certain price vector over the commodity space we will have an optimum for all the agents with regard to that price vector. All agents will then optimize their budgets and we will have m vectors, which in the two-dimensional case can be illustrated as in **Figure 2**.

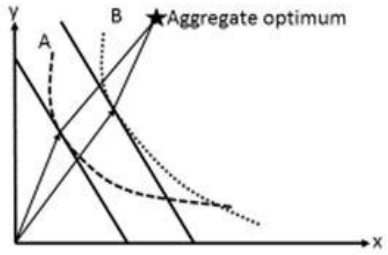

Figure2: Aggregation of Individual Optima

As a momentary picture this is no problem. All contextual considerations are done and we have to make the temporal choice. That is actually what Gerard Debreu advocates (Debreu 1987[1959]: 29-32) when he claims that commodities must be indexed according to time and space. Expressed in such a way the general equilibrium approach is a quite acceptable description of the market process. But then the optimizing choice by the agents is not really a choice but an equilibration of choice criteria created in the contextual considerations and then effectuated when the ruling price vector is applied. Thus in the market exchange there is no real choice but a deterministic application of an optimizing rule, and as we see the time is lacking since we assume that the agents and the commodity space and the context is given.

If we were to look at general equilibrium in this way we would have no possibility to explain a time trajectory other than in the case that all relative prices and endowment vectors as well as the preference structures are assumed constant.

Still we may claim that we might use the neoclassical general equilibrium model as a kind of general but simplified model of the real economy and thus analytical derivations may give us hints of the direction in how to act with respect to the real economy in policy matters.

Such a claim is the general claim of defence for the proponents of the neoclassical theory. To discuss this sort of claim we need to go deeper into the axiomatic structure and we must complete that with some comments on Arrow's paradox.

The role of the axiomatic structure is to claim that the interior processes of the individual can be described in exactly the same way as the outer commodity space and then to be handled in an ordered Euclidian space. Given Brouwer's dimension invariance theorem: P^n *is Homoeomorphic to* P^m *if and only if* $n = m$ we may then perform the same manipulation on the two spaces.[6] Thus we make the interior choice space of the individual pointwise equivalent to the exterior commodity space. This was actually what Jevons tried to do but the Arrow/Debreu approach is more efficient from a mathematical point of view, replacing utilities with a preference order. Applying Brouwer's theorem we however run into a terrible jumble when we try to introduce the time aspect. How do we actually handle the case where the dimensionality of the commodity space changes? Keynes mentioned actually this problem in the preface to the French edition of General theory (Keynes 1973[1936]:xxxi-xxxv). This means that any change of the dimensionality of the commodity space will create a discontinuity, which of course can be assumed in different ways but if so we enter a social analysis outside the realm of mathematical considerations. If additive aggregation should be possible according to Brouwer's theorem all preference structures must have the same dimensionality and all commodity baskets must contain the same kinds of commodities.

The axiomatic structure ends in two important principles: the independence of irrelevant alternatives and the principle of revealed preferences. Both these principles grant the reversibility of choices and actions.

[6] See for example **Weisstein, E.W.**, (1999). Entry: *Dimension Invariance Theorem.*

Axioms 1-3 are particularly interesting since they together with the symmetry definition give rise to an *equivalence relation*. An equivalence relation implies that two spaces are numerically equivalent:

> *Thus assume two spaces X and Y. We have then an* ***equivalence relation*** *between X and Y if there is a correspondence f from X to Ysuch that* $x_i \square x_j$ *in X imply* $f(x_i) \square f(x_j)$ *in Y.*

Consequently we understand that the concept of equivalence relation is the very basis for all manipulations within a Euclidian space for example. By using the first three axioms as a definition of rationality we achieve the situation illustrated in **Figure 3**. The first three axioms, although they are sprung out of pure mathematical logics, has come to represent what we call Axioms of Rational Choice. Indeed it seems a bit curious that purely mathematics could be so easily transformed to represent empirical processes. So let us look a bit at the three axioms what they really say.

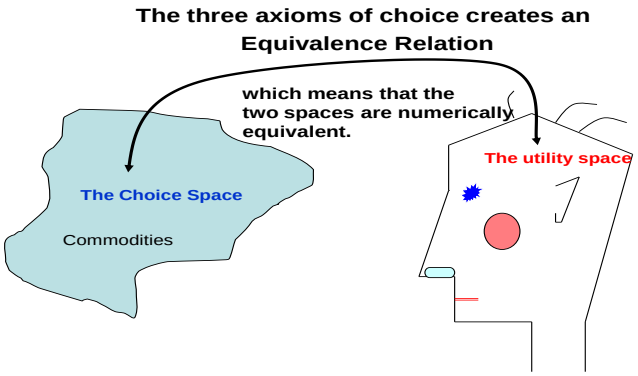

Figure 3: Numerical equivalence between interior and exterior space of the agent.

Axiom of Completeness implies on one hand that all commodities in the analysed basket are known and desired by all agents, furthermore all commodities can be chosen by all agents. Thus we have some idea of a perfect financial market.

Axiom of Transitivity looks a bit complex but it is necessary to achieve logical consistency. Per se the axiom is not particularly problematic if the choice is seen as a local and temporal act but over time we will have troubles but these are in fact in conjunction with axiom two.

The second axiom, *Axiom of Reflexivity*, is however the most crucial one, and we enter the Euclidian space as we relate to Euclid's axiom of a *Point* which is *independent of any structural relationships*. So when we go back to Keynes' allusion to the Euclidian axiom of parallels and the way it is linked to Euclid's axiom of the point as something which seems to be one-dimensional but at closer inspection has a dimensionality set by the chosen dimension of the actual analysis; the Point per se seems as a matter of fact dimensionless.[7]Inspecting the concept of a commodity, as it is defined by the neoclassical axiomatic structure, the axiom of reflexivity makes it independent of all structures. But once we have defined the dimensionality we have also closed the analysis as a consequence of Brouwer's invariance theorem. Thus when we allow for additive aggregation the society *is* the vector-sum of all individual preference curves given a certain price-vector which is also the general equilibrium. We then have to understand that such a locus, which is indicated by a star in **Figure 2**, is nowhere dense. Nowhere dense implies that loci thus defined has no environment. They actually form a sort of unique universe which you are either in *or* it does not exist. This is by the way the fundamental content of Arrow's paradox which we will later say some words about.

The Axiom of Reflexivity is also remarkable from another point of view. Often we try to persuade readers that a certain axiom seems to be relevant in a certain

[7] We actually receive a Cantor set of Points which are nowhere dense and which Lebesgue measure is Zero. The Cantor Set in conjunction with Cantor's Unaccountability Theorem was important for Russell in formulating Russell's paradox which we will use extensively later.

context but seldom that an axiom per se is trivial. Certainly in mathematics when defining an equivalence relation the axiom of reflexivity cannot be disposed of and that means that if we want to define a Euclidian space the axiom of reflexivity is fundamental. Many text book authors for medium and advanced levels of economics, really are making efforts to persuade readers that this axiom is trivial. Hal Varian (2006:35) tells us that *"the second axiom, reflexivity, is trivial. Any bundle is certainly as good as an identical bundle. Perhaps as children we may occasionally observe behaviour that violates this assumption, but it seems plausible for more adult behaviour"*.

Hausman (2012: footnote 1 p. 13) writes: *Reflexivity is trivial and arguably a consequence of completeness, whereas continuity, which is automatically satisfied for any finite set of alternatives, is needed to prove that preferences can be represented by a continuous utility function.* There are two problematic statements in the latter quote; the first is of course the triviality and the second is that reflexivity follows from the axiom of completeness, this is simply not true from a mathematical point of view. In an axiomatic structure every single axiom brings a particular aspect which is necessary to obtain the particular structure.

Anyway the reflexivity axiom states that a certain commodity is identical to itself, which seems plausible. However, as is shown in **Figure 3**, we deal with two different spaces; the interior choice space of the agent and the exterior commodity space and we try to define the first one so that we can use the Euclidian space for both the spaces given Brower's dimensionality theorem, which implies numerical equivalence. With respect to the outer commodity space we only need to deal with the physical characteristics of a commodity, the firms only produce physical things/processes. From the agents' point of view it is however different. The axioms states that the commodities are all independent of any structural relationships in the mind of the agents. So the axioms actually tell us that the agents are unable to form structures of commodity if we want to use the axiomatic structure inter-temporally.

This is actually why Debreu, basically a mathematician, made his specification of commodities in space and time, which of course seems correct vis-à-vis the real world.

Thus the consumers are denied to regard structures of commodities.

In such a case we also deny them the possibility of a choice which is context-dependent. The one who makes the choice is the one who controls the price vector.

If we reject the Axiom of Reflexivity and accept that consumers' choicesare context dependent we will have a rift between the demand and the supply side, the latter only producing commodities in their physical meaning. We then have to accept non-unique price vectors. Furthermore it invalids any form of additive aggregation of agents and/or commodities.

We have an interesting logical paradox which indicates some sort of peculiarities in the axiomatic structure, Arrow's paradox. Unfortunately more intellectual power has been devoted to discuss efficiency of democracy, voting procedures and such matters instead of trying to understand the precise meaning with respect to the axiomatic structure.

A logical paradox signals that concepts used has no unique interpretation. Arrow defines the axioms concerning the social welfare function by relating them to the axioms of choice, axiom 1 to 3 above, which means that we will have the standard additive aggregation if the agents comply with those axioms of choice and consequently the social optimum will coincide with the standard general equilibrium. But then he populates this economy with agents who are able to consider the aggregate result and to change that through compromises and/or voting schemes. Such agents are contradictive to the neoclassical agents and subsequently the conditions of additive aggregation will not hold and an eventual different aggregate result will not coincide with the neoclassical general equilibrium. This is actually a more precise discussion of the Mill/Jevons problem. Mill realised that the fact that people were taking aggregate results of the market exchange process into consideration in their decisions made it difficult to find a

link between the microscopic and the macroscopic levels so Jevons simply did not discuss the aggregate level but just for the momentary individual choice. The only ranking economist who has taken this problem seriously is actually Gerard Debreu when he indexes commodities according to time and spatial coordinates which make inter-temporal equilibria virtually impossible.

Thus between the two lines of economic thinking: the equilibrium and the disequilibrium approaches, there exists no possibility of compromise, they are contradictive in terms.

Atomic Fact Versus Complex Facts

The axiom of reflexivity thus tells us that the consumer values a commodity irrespective of its environment. Consequently it is independent of its appearance in structural compositions. That is also in fact recognized in general equilibrium theory where a corollary is that all commodities in binary comparisons are *independent of irrelevant alternatives*. Thus we in fact say that in our basic theory the agents' valuation of commodities are completely independent of structural matters.

We have consequently transformed the commodities and even so the agents to atomic facts with no substance. Thus we have a commodity space where the different commodities appear as the axis and the agents as vectors. However since commodities as physical items only occur as positive items, a commodity exists or not but it cannot in physical sense appear as a negative item. Furthermore all agents must consume all commodities by axiom 1 otherwise we get a problem with Brouwer's dimensionality theorem. We also rule out all kind of addictive behaviour through the Axiom of Convexity and furthermore we rule out the existence of lexicographic preference orders which are a reality in a negative sense for millions of people in the world.

Thus our transformation of the market exchange into a mathematical form and consequently commodities and agents into atomic variables in order to be able to

work within a Euclidian space has severe implicit effects for the meaningfulness of the neoclassical approach.

As earlier mentioned this was among the key issues of the analytical philosophy during the 20th century.[8]Russell makes the problems precise: *Attributes and relations, though they may be not susceptible of analysis, differ from substances by the fact that they suggest structure, and that there can be no significant symbol which symbolizes them in isolation* (Russell 1924[2007]:337).

This is fundamentally the problem underlying Keynes letter to Harrod and this is why the neoclassical theory based on a fairly simple 19th century thinking has missed the last 150 years of philosophical development in logics and mathematics.

Epistemic Cycles, Barter and Disequilibrium

We have rejected the Axiom of Reflexivity and by that we have also rejected reversibility as expressed in the Revealed Preference Theory.We have also rejected additive aggregation and the correlate of Independence of Irrelevant Alternatives.
It seems that there is not much left of the neoclassical theory with respect to the macroscopic level.
As a natural, but not perhaps easily seen, correlate to these rejections we may prove a theorem which will fundamentally affect our view of the concept of aggregation. It is quite natural not to say evident but we need to formulate and prove it.

Proposition I:

> *Assume a system A* consisting of a finite number of subsystems, which are to be regarded as proper classes, s_1 --- s_n. If then we have a measure allowing us to define an optimizing rule both on A* as well as s_1 --- s_n; optimization of the global system A* must imply that at least one of the subsystems s_i must sub-optimize.*

[8] In Ekstedt (2015; ch. 2) you will find a presentation of the main issues of the discussion.

> *If on the other hand all the subsystems, s_1 --- s_n are optimized according to the same optimizing process the global system A* must sub-optimize* (Ekstedt, 2012: 83).

Proposition 1 can never be proved within the axiomatic structureassuming general equilibrium. It is a generalized conclusion of a disequilibrium as the one appearing in Arrow's paradox. However we do not want to give up the concept of rationality but we will come back to that after an introduction of a particular concept.Gerard Debreu defines an agent as ($\square_i$, e_i) where $\square_i$is the i-th agent's preference relation and e_i is the corresponding endowment vector.

So let us define the out-of-equilibrium agent as ($\square_i$, c_i, e_i)where c_i is a set of epistemic cycles of the i-th agent.

The concept of *epistemic cycles* was first used by Thomas Brody (1993) and we introduce his concept in an extended form. We may illustrate epistemic cycles as in **Figure 4**.

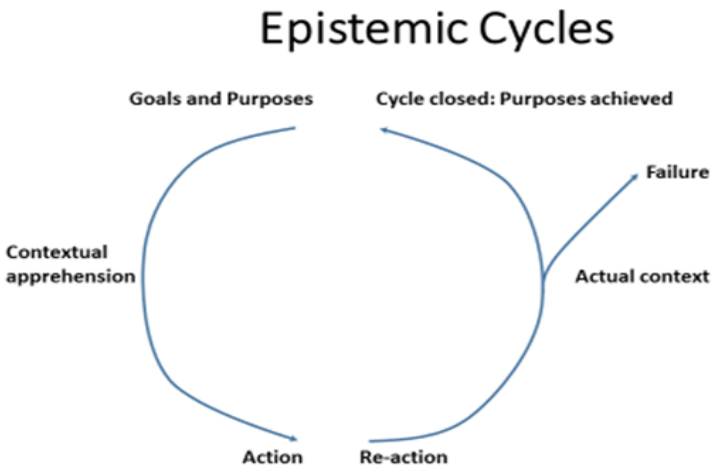

Figure 4: Epistemic Cycles

As we see the agent besides purposes and budgets has a contextual apprehension which may be different with respect to different purposes/commodities. We also see that a failure in closing the epistemic cycle will most probably imply reconsiderations of purposes and/or contextual apprehension which means that the conditions for the future will change.

As we see the concept of epistemic cycles will change the definition of the agents but it will also utilize the fact that commodities are contextually determined. Thus the commodities/purposes will be seen as part of apprehended structures.

From our new definition of the agent follows that we actually keep the neoclassical definition of rationality but now as a necessary but not sufficient condition. Rationality in this form implies two parts: one is the ordinary neoclassical rationality but the second part is the contextual apprehension.

If we touch on the difference between Immanuel Kant and David Hume we can see that while the neoclassical rationality is purely defined in a Kantian way since the choice space is only defined for the positive orthant. Rationality in the context of epistemic cycles however becomes parallel to Hume's analysis, since the execution of rationality is empty of any real substance/meaning per se, it is governed by passion/will or whatever we will call it.

The two approaches were actually brought to an ultimate test in the trial of the Norwegian mass-murderer Breivik, some years ago. One group of psychiatrists and psychologists claimed that Breivik was not rational, which means that he was not responsible for his actions. The reason for this was mainly his bizarre apprehension of the society. Thus the apprehension affected the concept of rationality.

The other group of psychiatrists and psychologists claimed that Breivik's apprehension of the society was not limited to him only but could be found in written texts both on internet and in other sources. Thus he could have deliberately chosen a set of available apprehensions, and given these apprehensions his actions were perfectly rational given his purpose to kill as many as possible. Consequently

he was found guilty of the mass murder and could not be seen as mentally sick to the extent that he was not responsible for his actions.

Proceeding to the proof of Proposition 1 we now need to bring in Russell's paradox together with understanding of the approach to numbers as in Cantor's paradox.

Russell's paradox version 1:

> *If for a set S_1 of elements, all possible subsets as well as the universal set belongs to S_1 we may say that S_1 belong to a non-proper class of sets. If however we have a set S_2 where the universal set of possible subsets does not belong to S_2 then S_2 belong to a proper class of sets. Consequently while the subsets of S_2 belongs to proper classes of sets the universal set S_2 does not, and that shows the paradox.*

Formally we can express it

Russell's paradox version 2:

> *Let S* denote the set of all sets which are not members of themselves. Then S* neither belongs to itself nor not belongs to itself.*
> *Formally we thus have*
> $S^* = \{x | x \notin x\} \, then \, S^* \in S^* \, iff \, S^* \notin S^*.$

The agents produced by the neoclassical axiomatic structure are defined as vectors in the commodity space which is a measurable Euclidian space. To do so we must be able to treat both commodities and agents as atomistic variables. That implicitly means that all agents are facing the same context and for all commodities hold that the physical entities are defining their role as commodities, thus either all items of commodity x_i have exactly the same physical features or all items of commodity x_i possess a substance which is the same for all items of x_i and which is desired by the agents.

So defined we may look at two sets of agents, s_i and s_j, which we may obtain by enumerating the different vectors. Let these sets of agents belong to an aggregate set $[s_i, s_j] \subseteq S_i$,and since $S_i \subseteq S_i$ we can proceed with the creation of new sets.
Thus for the universal set S* we find that the set $[s_1, \dots, s_i, \dots, s_n,\ S_1 \dots, S_m] \subseteq S^* \wedge S^* \subseteq [s_1, \dots, s_i, \dots, s_n,\ S_1 \dots, S_m]$, which implies that the universal set of agents is a set of agents. Consequently in Russell's terms neoclassical set of agents belongs to *non-proper sets*.

However, given that epistemic cycles are different, which is the case if we define agents as subjects, that means final causes, than the context of an agent contains all other agents but not self, which imply that agents, as subjects, belongs to proper classes.

Thus we have that the neoclassical agents form a universal set which belongs to itself implying additive aggregation. Our definition of agents which include epistemic cycles thus implies that the aggregate of agents never belong to itself.

The actual proof is to utilize the difference between non-proper and proper classes. Let us start with the first part concerning the optimization of the aggregate body will leave at least one agent sub-optimizing. Since the aggregate does not belong to itself the aggregate will affect the price-vector exogenous to the barter process among the individual agents, due to asymmetric effects on prices. The only occasion when we have a full and unanimous acceptance of the aggregate result irrespective of its effects on the price vector, but that is exogenous to the market process.

The second part when all agents optimize implies that the optimization efforts of the aggregate body will not affect the price vector and since the the aggregate body is not a part of itself and will subsequently sub-optimize.

Thus Proposition 1 is true for a barter economy as the neoclassical theory deals with it.

The result is self-evident since we reject additive aggregation and since our rejection of the reflexivity axiom also mean that commodities are not atomistic but complex. Technically this is rather trivial since we only add some further restrictions on the problem and that is the very essence of the concept of epistemic cycles but these might include social and moral aspects and might also be dependent on the individual's information, education, current social structure and similar factors. We can summarize the very disparate matters that might affect the set of epistemic cycles as:

- An Epistemic Cycle (EC) is a set of concepts and axioms in a certain epistemology which creates a proper logical structure.
- An EC may be inert or dissipative in the sense that influences from the environment may change the epistemology as well as the axioms.
- An EC may be created by a set of systematic observations as well as by scientific traditions.
- An EC may be formed by ethical, historical, religious and cultural traditions.
- An EC may be formed by ignorance, prejudges and lack of information

But important is that an agent can be assumed to be rational within an epistemic cycle. It is also important to keep in mind that authorities on aggregate levels have their epistemic cycles set by the, bureaucratic traditions and agendas internal to the authority in question. The concept of EC may be developed considerably but that is outside our purpose in this paper.

The Mysterious Money

We live in a money economy. We do not purchase commodities in a barter system. Money is an anomaly in the neoclassical economy. The *price vector* is a unique measure of a specific equilibrium in an ordered Euclidian space, which may allude to prices/money but it has not anything with prices/money in ordinary business to do. Keynes discusses "primitive stone moneys of Polynesia" in the beginning of *Treatise of Money* (1930: 14) which is a better allusion to money.

The price vector of the neoclassical equilibrium measures the precise optimizing exchange relations for *one and only one* precise general equilibrium, and to each kind of possible combination of ($\square_i$, e_i) there exists one unique equilibrium. Subsequently we have infinite different optimal price vectors in the economy. Furthermore the different possible equilibria are not connected but *nowhere dense*.

Consequently it is hard to interpret the general equilibrium price vector in what we understand as prices in everyday business.

Furthermore the fact that different equilibria are nowhere dense implies that no convergence processes exist, since the equilibria has no environment. This is why Walras discussed two converging processes; the auctioneer and the tatonnement processes and during these convergent processes no exchange takes place since we then has the case of false trading. When we enter the more precisely expressed axiomatic structure of the Arrow-Debreu setting this is fundamental since an axiomatic structure always defines a set which is nowhere dense. Either you are in the defined structure or you are not, it has no environment. Consequently we cannot even think of a set of different states of general equilibrium and mathematically describe a converging process during which economic exchange can take place. Suggested methods as lump-sum taxes and other ingenious tricks fail if the agents do not behave as prescribed by the axioms so the question is who are going to inform them that the initial endowment distribution is wrong, which is a natural question in the realm of Arrow's paradox.

In Keynesian or other approaches we base our analysis on money values and/or manipulated money values. Often Keynesian models make some money market arrangements for money but we seldom see the concept of money discussed. Furthermore the dimensionality problem, essential with respect to all form of price indexing, is even more seldom discussed although Keynes noted that problem in particular (1936[1983]:xxxv). It is with respect to price indices the dimensionality of the commodity basket becomes a sensitive issue. In Ekstedt (2015: 131-134) it is shown how a change in the dimensionality affects the prices. A period of growth in the number of commodity dimensions will if it is not explicitly accounted for in the

inflation indices appear as increased inflation and subsequently a strict anti-inflation policy in such a case leads to deflation in real terms.

This appears since the concept of real growth builds on nominal prices and the manipulation of these. Since the underlying theory of price indices refers mostly to the neoclassical theory, as the most formalized theory, we arrive at the conclusion that these inflation indices are meaningful for the real economy if we are in a general equilibrium, if not, there is a theoretical mismatch where no conclusions can be drawn scientifically.

The Fundamental Contradiction of The Money Economy

Whatever inflation index we use it is related by some function to the current nominal prices. We work with the current money values of commodities and production factors. Money values, current and also fixed, can always be additively aggregated since money is classified logically belonging to non-proper classes. That means that the universal class of money values belongs to itself.

The result in Proposition I builds on the fact that the commodities are complex in the sense that the agents relate them to desirable/non-desirable structures. Money values however are independent of the underlying demand-structures and the commodities per se. That means that the axiomatic structure of the neoclassical theory relates a particular money value to one and only one commodity which is independent of any context. But that also means that aggregate money values are independent of the real content of underlying commodities.

We then find that Russell's paradox is no longer applicable and we have to draw the following most annoying conclusion:

Proposition II:
With respect to a real analysis equivalent to barter, the proposition I holds.
When we pass over to a non-equilibrium analysis where goals and restrictions are formulated in monetary terms we lose all logical relations to the real economy and consequently proposition I has no meaning.

This proposition is most unsatisfactory since it indicates no logical links between analysis of a barter economy in equilibrium and a monetary economy ofany sort. As we claimed in the beginning: *the neoclassical analysis and Keynes' analysis where proper attention is paid to the problem of atomic and complex variables are contradictive in terms.*

Proposition II is a pure logical contradiction not derived from empirical observation but rises out of the very character of the concept and the difference between real commodities and money as we think of it in daily business. Let us therefore scrutinize the concept of money a bit more. Let us first of all allude to Jean Baptiste Say's resolute rejection of money and prices as a kind of general measure. His examples of the Pyramide of Ghaize and the price of camels indicate that prices are contextually determined. That means that local and temporal equilibria are the only existing equilibria. Money however can be used for local and temporal exchange without any relation to exchange in other loci in space/time. We arrive at a local and temporal state of equilibrium when the momentary price is agreed upon and that will certainly affect the respective agents with respect to budgetary and liquidity matters but how that affects future actions remains to be seen. The important point however is that money in the everyday sense adapts to such a non-equilibrium economy of any real shape. Thus motives, desires, contextual apprehensions are hidden but we actually know the sums involved in the market exchange.

Thus we come to the question of how we shall understand money. We have earlier mentioned the three usual dimensions involved in the concept of money: medium of exchange, liquidity and accounting measure of historical, current and future assets/liabilities.

Money as a medium of exchange is as Hume writes (Essay I of Commerce: 45): "*It is none of the wheels of the trade: It is the oil which renders motion of the wheels more smooth and easy*." (Our underlining). Thus we can imagine that manipulations of the items supposed to be contained in the concept of money will

have effects but these effects are not linked to the basic causes of trade but to the circulation and use of money.

Thus if we are able to affect the total volume of money it will certainly affect the trade in different ways but in a non-equilibrium economy there is no way in which we can measure the microscopic effects out of the macroscopic. This is actually why we can handle the aggregate economy per se in money terms. But the macroscopic effects will have asymmetric distribution effects of which we can say nothing in the pure macroscopic analysis but only by further microscopic investigations. Consequently the microscopic effects will have future effects on the workings of the macroscopic level by affecting the underlying "wheels" of trade, in Hume's wording, but the character of the effects are to be seen by investigating the actual socio-economic structures. The Swedish economist Knut Wicksell was actually one of the first to express this thought when he accept local and temporal stability on the microscopic level due to reversibility but rejects reversibility at the macroscopic level and thus also stability. This was supported by Keynes in his discussion in General Theory (1936[1973]: 17-18).

Money as a medium of exchange is the most fundamental dimension of the money concept since that creates the basis for the other two intrinsic dimensions. The liquidity aspect is linked to lexicographic preferences, which is outside our scope in this paper, but in Ekstedt (2012: 162-164) there is a comprehensive analysis and we concentrate on money as a measure of assets and liabilities which has been the central aspect of the current austerity policy.

Our rejection of general equilibrium and additive aggregation together with the propositions I and II implies that we have to ask two quite different questions. The first is how macroscopic policy affects the microscopic level and economic structures. The development of income and wealth distribution is utterly important to scrutinize, "Oui Bono?", is the ever fundamental question which can be replaced by – "Who Pay?". When we pay back a debt, how do we compare the initial nominal value inter-temporally when we are in a disequilibrium economy. This is actually a rather scary question and points towards redistribution processing and socioeconomic effects in a longer run.

The Real Bill and The Quantity Equation

The subprime scandal 2008 was primarily an effect of careless lending and careless supervision of the financial system. Many economists of course early realized the danger of the development of subprime lending but the rally was unstoppable. But from the reactions afterwards from financial organizations and actors it seems that they also were surprised of the large effects of their own carelessness. Among the deeper effects was the fact that the systemic trust disappeared and furthermore the concept of risk had to be reconsidered.

In fact the subprime scandal revealed a more fundamental institutional change in the international credit system and we can say that the current development is a reversed development compared to that which was initiated by Henry Thornton and David Ricardo in England and took a definite form in Ricardo's Ingot Plan 1826, published posthumously and installed in the Bank Charter Act in 1844. Money supply and banking matters were then put under the control of Bank of England. We then could talk about the money supply and the Quantity Equation. The Bank Charter Act was much discussed and it was a debate continuing the issues discussed in the Bullionist debate but now the different sides were called the Banking School analogue to the Real Bill principle and the Currency School analogue to the Bullionist approach. According to the former the Quantity equation was meaningless and in the light of the latter is was a central instrument of control. It is interesting to see Wicksell's comments on the theoretical issue with respect to a possible Theory of Money:

> *I already had my suspicions – which were strengthened by a more thorough study, particularly of the writings of Tooke and his followers – that, as an alternative to the Quantity Theory, there is no complete and coherent theory of money. If the Quantity Theory is false –or to the extent it is false – there is so far available only one false theory of money and no true theory* (Wicksell, 1936: xxiii).

Thus Wicksell realized the complexity of money but this complexity was not touched upon in the mid-19th century debate. However in the bullionist debate Henry Thornton par preference discussed the deeper problems of money.

Let us however look at the foundation of the subprime scandal. The Bullionist debate in the beginning of the 19th century actually concerned the basic principle of subprime lending. It is closely linked to the Real Bill principle, which was advocated by Smith and contrary to monetarism/Currency School.

The real bill principle has little to do with money supply and the quantity equation and consequently inflation is generally regarded as created by excess demand or other real factors. Bank lending should be related to appropriate securities which means that a loan is not drawn from a permanent stock of money but is related to the abilities of present sufficient securities. Thus if an agent present a sufficient security we can obviously transform the loan into a bond which given a calculated risk can be sold to the general public and in the next instance could be used as a security, thus with modern technology the amount of law money/regular money can be increased to almost infinity.

The monetarist approach which during the 20th century was more or less regarded as the theory of money has to do with currencies as the Currency School indicates. In order to keep the balance of payment money had to be controlled both with respect to external as well as internal affairs in order to balance the external trade.
The Quantity Equation of money is identically true, thus we can write:

$$M \cdot V \equiv P \cdot Y$$

and as such no theory. It becomes a theory when the variables are properly defined with respect to the empirical phenomena and here lies the difficulties. In a closed economy it might be possible to define them approximately but advanced technology and changing credit structures may make it difficult enough. For a globalized economy it is virtually impossible to define the variables of the Quantity Equation. This globalization process is actually the prime cause why we have a movement back on the credit market to the real bill principle.

The currency factor in business more is affected by financial flows than by real flows. That also means that regional/national inflation will have a different role then for example during the Bretton Woods days or during the 1970s/80s when countries tried to stabilize the currency variations. Inflation was then thought of as a real variable while nowadays the role of inflation has to do with the relative valuation of assets and liabilities according to present value calculations like in a formula as:

$$K_0 = f\left[A_0\,,\quad \frac{Y_t}{(1-(r+p))^t}\right]$$

Where r is the real rate of discount and p is inflation. A_0 stands for a sort of general uncertainty/nervousness factor which relates to the believed macroscopic status affecting real production and financial flows. It may sometimes cover traditional uncertainty factors but sometimes it covers social unease and particularly the public (in a broad sense) reaction to this. What has happened after 2008 is not only that the solidity factor has been crucial but also a greater concern of global risk factors. To try to give a mathematical form and more specifically parametric values to A_0 based on economic theory of any form is a vain occupation.[9]Thus inflation affects inter-temporal valuation according to purely accounting principles. Hyman Minsky adds a growth factor into the discount factor but sadly to say when dealing with global business with a great variety of macroscopic events on different geographical and structural arenas financial organisations are seldom able to calculate such a complicated matter for broad financial flows, which naturally means that inflation receives a heavy role in the volatility of the financial market beside the expectation/nervousness factor.

[9] There are however mathematical methods which are developments of Black&Scholes, the Heston approach for example aiming to find appropriate option prices based on the most recent actual market prices and the most recent volatility. Methodologically the method do not say anything on the causes of changes in volatility and distribution but accept the imputed data as it is. The approach cope with daily business and are not to be used with respect to structural long term questions.

So we can say that during the 1980s/90s inflation came to be a factor in the valuation of assets and liabilities and since the cross-border financial flows were 10-15 times greater than the real flows the effect of inflation on financial flows became the most important. Not that the real flows were unimportant but they were more interpreted as affecting the A_0 in the present value calculations above. The general feeling was that inflation had to be coped with immediately and that is was not the governments but the central banks which were in the focus of policy making. For macroeconomists the whole development seemed to be completely out of bounce but if we realise the change of policy from macroeconomic structural policy to more or less pure accounting policy for banks and other financial organisations it is easy to understand. The valuation of historical liabilities and of future perspectives with respect to lending and borrowing seemed to become the most important macroeconomic goal leading to permanent unemployment and little interest of negative growth. In figure 5 we illustrate the relation between the developments of the world trade and the world GDP. As we can see we have a remarkable slow-down of world GDP and international trade but the GDP slow-down is the most notable.

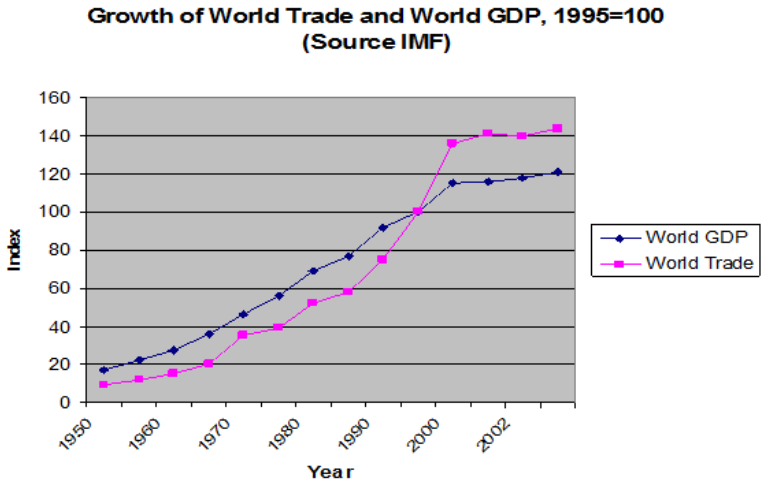

Figure 5: Growth of World Trade and World GDP

This policy went on for a couple of decades when we got the final catastrophe due to the scandalous behaviour of banks and money supervising authorities autumn 2008. So what went wrong?

Let us start with two **figures, 6** and **7**. These figures represent the extreme cases which we do not have in any country but we can see a clear movement from **Figure 6** to the case illustrated in **Figure 7. Figure 6** represents broadly the monetarists/currency school. The central bank controls the money supply and banks and the general public have to comply with a set of rules.

Figure 7 represents the real bill approach/banking school. Banks lend money in the first instant but these loans are securitized and securities are sold to the general public as well as the financial sector. The banks earn money mainly by the interest difference between outstanding debt and the liabilities to the depositors. However due to the globalization and new financial instruments and growing derivative markets non-financial firms were able to raise money outside the regular bank-sector, SWAPS and other derivatives were used for both short and long term finance and to a certain degree the general public and particularly big conglomerates became competitors of the bank on markets which before were only for banks. This implied that banks in the 1980s/90s suffered from decreasing profitability.

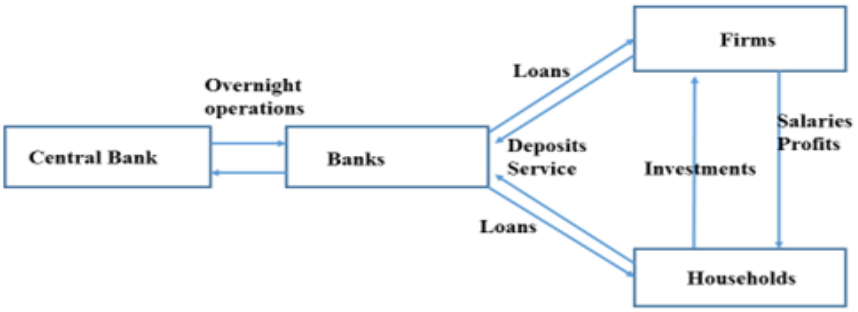

Figure 6: Central Bank controlled monetary system

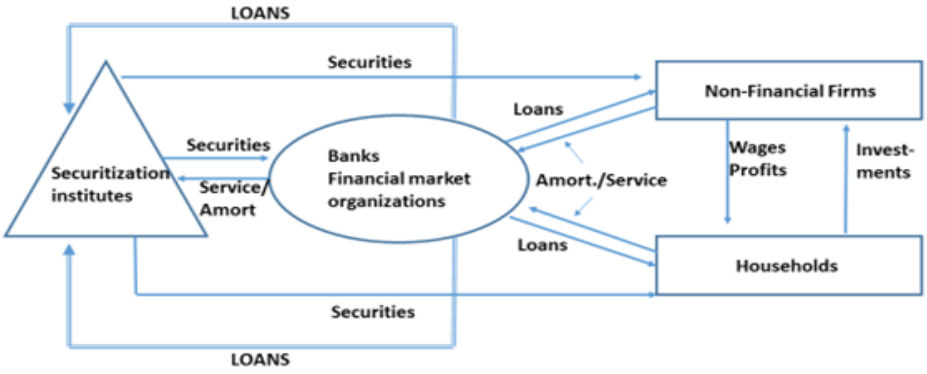

Figure 7: Real Bill System

With respect to **Figure 6** the banks in principle have to take all the risk for the outstanding debt while in **Figure 7** the banks are just mediators between the clients and the securitizing institutes. The banks run virtually no risks with respect to the outstanding debt but for the portion of outstanding bonds bought by the very bank itself.

How do the banks earn money in this system? First of all the banks take a fee for transferring money to the securitization institutes and secondly they cut a fraction of the nominal bond rate. That means that on the interest rate paid by the public to the securitization institutes is laid a fraction going to the bank mediator. Evidently the situation of the banks will change substantially. In principle all risks are transferred to the security holders and furthermore the profit of the banks will be positively related to the volume of lending. But who controls this system? Fundamentally it is the banks themselves which are the ultimate controllers, they have to check the bona fide of all borrowers but the borrowers of one bank are as we said only a tiny fraction of the total market so there is no substantial risk in being a bit easy going on such controls but that means that if we take the standard categorization of un-systemic and systemic risks we understand that we will have a decrease in the un-systemic risk at the expense of an increase in systemic risk. This

was intensively discussed during the bullionist debate in the early 19th century and particularly Henry Thornton warned about this problem.[10]

But during the late 1990s and early 2000s the financial markets and the responsible authorities were either naïve or not with respect to the ongoing process which was seen by many economists who warned against it but not seen or consciously neglected by more. The basic problem of a system like that in figure 7 is thus the security problem furthermore if we think of rather tight controls and fairly severe consequences with failure it is not unreasonable to think of a redistribution of bank lending in favour of lending to house for rich people and for strong companies. Particularly small scale companies and entrepreneurs will have difficulties to raise money.

The ongoing process of increase in importance for systems like the one illustrated in figure 6 at the expense of a decreasing importance of traditional central banks, and how the latter should influence production and employment is a meaningless question. Matters like money supply becomes meaningless to discuss. Already Henry Thornton (1802[1939]: 18) discussed the creation of money and made a distinction between the capability of circulation and forced circulation of a paper, forced circulation was attached to law money while securities had the capability of circulation meaning that the latter were possible to use as money while the former were defined as money. A consequence of the digital revolution is that in the time dimension the capability of circulation of a paper might approach infinity.

What is said here is directly opposite what was discussed in the Bullionist debate. We have thus to understand the historical context of that debate. It started during and in the aftermath of the Napoleonic wars. It was a period when the national borders were strengthened and national interests were at the top of the political agenda and it became vital to build up national defence as well as a strong national financial system.

[10] As a matter of fact Sproul (2000) attacks Henry Thornton's analysis as being accusing bankers to be unethical.

Consequently we shall not discuss whether one or the other system is better or worse as was done during the 1980s/90s but which system is the workable during the specific context. Most of all the institutional system with respect to rules and supervision has to adapt to the specific features of the respective system. However it is interesting that the concept of money per se does not change although the question of the money stock of the state disappears more or less as a policy variable and also as an analytical variable.

Thus the complexity and the intrinsic contradictions of the concept of money due to the different roles of money which are created by its role as a medium of money imply that we are probably never able to create a general theory of money but to observe and analyse the role and patterns of money and finance in the current context.

We have mentioned about the austerity policy during the recent years. It is obvious that we cannot finance our consumption by printing state bonds or increase the circulation of money per se. Furthermore lending/borrowing operations has to be performed at the pleasure of those involved and risk incurred has to be accepted. A sound economy requires production and consumption. This is practical wisdom from before Aristotle's times.

To crave austerity in order to pay bygone mistakes is even more problematic. What are we really paying back? In a certain sense the neoclassical economy is sound namely that it takes the stance in the real economy, you cannot eat money. That means that applying accountancy rules and the same perspective on macroscopic affairs as we were dealing with on the microscopic level is indeed questionable.

The question who is responsible for an economic policy which have destroyed economic growth for years, to have created social conflicts and instability, to have created poverty among large groups and made the rich richer and the poor poorer. Certainly we economists are to blame who have sacrificed economics as a social and empirical science in order to be able to trot around with an economic theory built on the axiomatic structure of a medieval village, a theory incapable of handling a central concept like money.

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Introduction

Banking, whatever its form may be, is an integral part of economic activities since the classical ages. However, during the course of the time, the methods and techniques of this industry has become so developed and sophisticated that banking is an indispensible part of not only firms but also all individuals in modern times. The most important feature of banking in the 21st Century is, although financial services seems in the heart of the economies, their disassociation and independence from the industrial capital. Hilferding ([1910]1981) defines this era as financial capitalism. This sophisticated structure of banking and financial services are the main source of rapid development of industrial countries in the one hand, and also the biggest financial and following economic disasters in these countries on the other. The big crash of 1929 originated from a big collapse in the Wall Street. Additionally, the last crisis of 2008 began with a meltdown in financial assets in the US and the UK. Experiences in the last three centuries show that uncontrolled and unregulated financial institutions may give more harm to their hosting economies than the wealth they created by their complicated techniques and instruments.

Probably the most important transformation in the last century is the turning industrial capitalism to financial capitalism (Dembinski, 2009). Gilpin (2001) also identifies industrial capitalism after the 30 years following the World War II. Financial capitalism begins to take the place of industrial capitalism in the middle of the 1970s. Although financialization exists in both financial and industrial capitalist periods, it changes its patterns in the mid 1970s. During the Post World War II era, financialization mainly funds the development projects both in the US and war weary Europe. In this era, financialization coexists with industrial capitalism. With Hegelian terminology, it exists in itself within the industrial capitalism. However, beginning with mid 1970s, in the Carter and Reagan administrations namely, financialization enters an era which exists for itself. This character of financialization becomes more visible in the second term of President Reagan (Tarhan, 2015). Therefore, an assessment of financialization requires first to distinguish in and for itself periods of this process, and then to evaluate the capital flows between the developed core and the developing periphery. Locating

the sources of financial needs or disabilities of developing countries also consists of an integral part of these analyses to understand the feasibility of financialization, and shadow banking for these countries.

1. Securization and Financialization

The two big crashes of 1929 and 2008 occurred in and around the financial services. The most blamed parts of these financial services during the crises are securization and financialization operations. Unlike the 1929 crash, these two kinds of operations of financial services are organized under an unofficial framework of shadow banking in the latter crisis. Having created a more wealth than the real economy can afford, during the economic booms the shadow banking system is not the main source of complaints. However, when the events go wrong and economies face with contractions shadow banking worsens the situation by even more contractions and bankruptcies in financial services. Therefore, the purpose of this section is to define main characteristics of securization and financialization.

1.1. Securization

The simplest form of securization is to issue securities in financial markets in order to raise debt (Feeney, 1995). This is the primary securization and banks' balance sheets are not affected by these operations and they reestablish their financial statements in a more liquid form. Consequently, by selling securities banks enhance their liquidity levels and continue their lending processes. Otherwise, they had to raise their liquid funds by increasing their deposit portfolios which is over dependent on non bank economic conditions such as marginal propensity to save of their customers.

Securization is one of the financial innovations used by banks to improve their financial abilities alongside the certificate of deposits (CDs), money market mutual funds (MMMFs), and repurchase agreements (RPs or Repos) between the 1960s and 1990s (Sevic, 1999). However, this era has not witnessed a major global economic catastrophe stemmed from the financial services due to the effective regulations over the banking industry in the US and the UK, with the exception of

savings and loans crisis in the US. On the other hand, the provisions of securization provided necessary tools for a bigger form of this process in the structure of financialization during the 1990s and 2000s which brought the great meltdown of 2008.

1.2. Financialization

The base of the financialization is secondary securization. Banks realize secondary securization by holding their existing loan assets in a pool and turn them into securities, and sell them to investors in capital markets. By these transactions they remove asset from their balance sheets (Feeney, 1995). Financial industry has invented indigenous tools in order to create more liquidity in the financialization process. Therefore, financialization is in fact a generalized form of securitization, and inevitably coexists with globalization (Lavoie, 2013) as the domestic markets reach to their consuming limits. Due to its almost limitless liquidity creating capacity, financial industry overshadowed the industrial capitalism during the 1990s and 2000s, and caused a massive deindustrialization in the US and the UK. Thus, with this transformation, the financial sector of the US and the UK divorced from their long term companion, the commerce and industry, and turned into an existing for itself entity (Giron and Chapoy, 2013).

The primary innovative products of financialization process can be sorted as asset-backed securities (ABS), mortgage-backed securities (MBS), residential mortgage-backed securities (RMBS), asset-backed commercial paper (ABCP), credit default swaps (CDS), and collateralized debt obligations (CDO) (Gorton and Metrick, 2009). The most distinguishing feature of financialization shows itself in operational and legal realms. As a rule, these securization transactions are realized outside the regulated traditional banking system, and this system is called as shadow banking. The whole process of financialization can be expressed as the domination of a financial markets and institutions over the real economy. In the end, this domination transforms the whole economy from industrialization to financialization (Palley, 2007). As a consequence of this process, beginning with the early 1980s, the US economy turned into a consumption driven economy.

However, much of the US consumption has been financed by an unsustainable debt burden of its consumers during this epoch (Hein and Truger, 2013).

2. Shadow Banking in The Developed Core

The legal systems of the US and the UK provide almost limitless contract opportunities for individuals and firms. In addition, with Glass-Steagall act in 1933, the US authorities broke the ties between the banks and securities firms, and created legal privileges for the latter by keeping them outside the official obligations of traditional banks. Securities firms, or investment banks in other words, are monitored by the US Securities and Exchange Commission (SEC) from 1934 onwards. However, SEC's monitoring has not created much effect over the transactions realized by the investment banks due to the non-breakability of mutual and/or multilateral contracts under the provisions of the Anglo-Saxon legal code. Consequently, almost all shadow banking transactions have been realized with special legal entities known as special purpose vehicles (SPVs).

2.1. The Structure of Shadow Banking

SPVs are legally created firms in order to perform certain financial activities and contracts in the form of securization. SPVs are almost fictitious bodies which have no spatial entity or personnel. They are controlled by sponsors or the agents of the originator firm. Because of their legal nature, they are immune to the bankruptcy and taxation (Gorton and Souleles, 2005). In this system, banks provide credits to their customers and receive deeds against these transactions. In the second stage, banks transfer these loans to SPVs, and receive securitized bonds and cash. In the third stage, SPVs sell these securitized bonds to MMMFs, and receive cash. MMMFs sell these securitized bonds to their retail customers as shares. MMMFs hedge themselves against the probable losses with repos. In order to do that MMMFs deposit certain amounts in initiating banks and receive assets as collateral (Gorton, 2010).

2.2. The Outcomes of Shadow Banking

Main purpose of the Glass-Steagall act was to break the banks' ties with the securities markets in order to prevent banking industry from putting their customers' money in risky investments. During this regulation primary cash sources of the US banks were deposits. The only remaining area for the US banks in order to attract more deposits was to make innovations in these accounts such as checking accounts or NOW (negotiable order of withdrawal) accounts. On the other hand, the rapid growth of financial markets during the Carter and Reagan administrations forced later administrations to remove the barriers between banking and capital markets. This barrier was finally removed during the Clinton administration with the Gramm-Leach-Bliley Act in 1999. Consequently, after having suspended over a century, interrelations with commercial and investment banks were re-established (Adrian and Shin, 2009). These newly implemented ties not only gave the way for big scale shadow banking, but also shifted the financial hub from banking to capital markets. Taking into to the account of unlimited freedom in individual contracts and the absence of government intervention, the shadow banking system can be considered as the purest form of capitalism.

3. Shadow Bankıng and The Developing Semi-Periphery

For itself stage of the developed countries' financialization goes parallel with the developing world financialization. Since the lack of regulations or proper control over shadow banking activities in the US and the UK, the mass volume of funds created by financial services are also uncontrollable. Therefore, the primary role of financialization in the semi-periphery is to create a niche for the surplus or shortage of the developed core's funds (Tarhan, 2013). Consequently, beginning with the early 1980's, developing periphery becomes more vulnerable to the destructive effects of sudden capital in and outflows.

3.1. The Spread of Financialization Through The Semi-Periphery

During the Cold War period allies of the US and the other developing countries in the Western bloc have been financed directly by the US government or its

agencies. Most important element of the aid system has been the military assistance of the US government. In this period developing countries were heavily relied on the cheap military surpluses of the US army, so that they could restricted their scarce funds to development projects. However, with the Reagan administration, these transfers have come to an end, and consequently developing countries have had to allocate more shares for their defense budgets. This process has made them more deprived for foreign funds to finance developmental projects (Tarhan, 2014). The end of government to government loans and military aids has made developing countries involuntary customers of the international capital markets. Therefore, 1980s are the settlement years for emerging economies with international capital markets.

Due to the lack of adequate domestic capital markets and legal framework, most emerging country banks realize their securitization operations in world financial centers with big investment banks. Dramatically, in many cases, the assets controlled by these investment banks are far larger than the applying countries' annual GDP. Therefore, terms and conditions of these dealings are subject to the more powerful party's will, or dictation (Duménil and Lévy, 2001). Contrary to the expected outcomes, developing countries' securitizations' are short termed, and fall short of the necessities of long term development projects. Thus, short termed capital inflows to the emerging markets discourage the long term development projects, and encourage the short term commercial and/or land development projects.

3.2. Shadow Banking and Semi-Periphery

Developing countries have different institutional arrangements comparing to the developed countries. First important difference stems from judiciary structures of the former countries. Unlike the developed countries, legal structure of developing countries does not support unlimited market or contract freedoms. Thus, government controls and regulations over the economy in these countries are stronger than in the developed core countries. In an era of financial globalization this legal structure discourages or makes impossible financial innovations in developing countries. Consequently, providing the capital controls do not exist or

discouraged by the international financial authorities such as the International Monetary Fund, financial capital flee from these countries to the more liberal countries. Further, the state structure of these countries does not comply fully with the requirements of financial capitalism since the lack of the rule of law. In most cases, developing country state structures comes in the form of a predatory state which hinders the transformation of individual wealth to productive capital in the markets (Levi, 1988). Additionally, predatory taxation also discourages foreign investors and foreign direct investments in developing semi-peripheral countries.

Huang (2007) explains basic differences between the developed and developing countries with their cultural structures towards the markets. Huang sorts these differences in rigidity, individualism, objectivity, relationship, merit, time, and influence fields. As developed countries more rigid in following the rules, developing countries are more flexible in this field. Developed countries are principally individually focused, but in developing countries groups are more important than the individuals. Developed country individuals tend to avoid subjectivity, and focus on their tasks. On the other hand, in developing countries, individuals are more subjective and relation oriented. While promotions are based on merit in developed countries, developing countries give priority to social relations in promotions. Because of these institutional, legal, political, and cultural differences, a full integration of developing countries with the developed markets has not yet been fully accomplished.

This failure reveals some positive and negative outcomes for developing countries. First, because of these sorted reasons, shadow banking has not been institutionalized in these countries. Therefore, banking industry of developing countries realize their securization operations with the investment banks of core countries. However, this tendency poses some negative and positive implications. Negative ones are the over dependency on foreign funds and foreign financial institutions, and the short term nature of available funds. Positive side of the situation is that developing countries have an access to foreign capital markets.

Conclusion

Securization is an integral part of modern banking systems. Without securization, it would be impossible for banks to renew their loanable portfolios. However, latest crises have shown that unlimited securization, ending with a total financialization, have devastating effects on both industry in particular, and in whole economy in general. Moreover, securization and following possible financialization have different effects on developed and developing economies. Therefore, this study suggests that it is crucial to distinguish the state of an analyzed country in order to reach a verdict about securization. Securization, if clearly monitored, may be useful for developing semi-peripheral countries to realize their development projects. In order to do that securitizing agencies should be differentiated from the traditional banking system to block the spread effects of possible financial crises into the traditional banking industry. Second, monitoring agencies, like central banks, treasuries, or inspection authorities should be chosen carefully and integrated with each other with well-defined jurisdiction borders.

Rules and regulations for developed economies may consist of different sets of criteria. As widely accepted, heavily regulated financial markets cannot easily create financial disasters. However this claim ignores the political power of big financial companies. As 2008 crisis has showed that power of financial conglomerates easily offsets the power of political parties or other interest groups. As long as this picture stays as reality, a total financialization of an economy cannot be stopped or controlled by the state authorities. This is the basic dilemma of today's US economy. In this case, the only unknown progress in this economy is the timing and scale of the next crisis. As a sum, this study suggests a more democratic participation in economic decision making processes, and more regulation and monitoring in financial services. Regulation and monitoring may not be the only panacea for prospective financial crises; however, they may reduce the scale of these catastrophes.

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Introduction

During the last financial crises, a wave of criticism fell on credit rating agencies. These institutions were alleged to be too late in responding to the actual market situation and of disregarding adverse changes in the issuer financial condition. As a result, it may be questioned whether the information about the credit ratings changes published by the mentioned institutions has a significant influence on the financial market.

Manso (2013) suggested that agencies are often criticized for being biased in favour of borrowers. As a result, they are too slow to downgrade credit ratings. The mentioned situation introduces confusion on the financial market. As a result, he proposed a model that takes into consideration the feedback effects of credit ratings. He found out that credit rating agencies (CRAs) should focus on the probability of survival of the issuer, not only on the accuracy of credit ratings proposed by the mentioned institutions. Even if CRAs pursue an accurate rating policy, the multi-notch downgrades or immediate defaults may occur in response to small shocks to fundamentals. It is also observed that the increased competition between the credit rating agencies, can lead to rating downgrades, increasing default frequency and reducing welfare.

Almeida, Cunha, Ferreira and Restrepo (2016) analysed the impact of sovereign credit rating downgrades on firm investment and financial policy. They found that the downgrades lead to decreases in investment and leverage of firms that are at the sovereign rating bound, relative to otherwise similar companies below the bound. Their findings suggest that public debt management generates negative externalities for the private sector and real economic activity. Credit ratings are taken into consideration during decisions taken about investment and analysing costs and benefits associated with different rating levels (Kisgen, 2006-2007; Kisgen and Strahan, 2010). The rating levels determinate decisions of First, ratings can affect whether institutional investors such as banks or pension funds are allowed to invest in securities. The mentioned changes have an influence on the capital requirements of banks and insurance companies. The credit rating

announcement suggests the credit quality of the listed institutions. Graham and Harvey (2001) find that credit ratings determine the capital structure.

The introduction the Moody's Investor Service into financial market and credit ratings proposed by them, contributed to an increase an investment of securities of firms that did not have a credit rating before 1995 (Sufi, 2009). The analysis of the impact on the debt of the rated institutions has been prepared by Lemmon and Roberts (2010). They found that the structure and the dynamic of the capital strictly depends on the financial cycle. The receiving of the credit rating by junk rated firms decreases the investment on their securities more than in the case of those that do not have credit rating notes. Tang (2009) emphasised on the other hand that the having the credit ratings increases in debt and investment of upgraded firms versus downgraded firms.

The presented research suggest that credit rating changes should impact on the prices of the securities on the financial market. As a result there have been prepared researches connected with the mentioned changes on the CDS spreads (Hull, Predescu and White, 2003; Norden and Weber, 2004; Gantenbein and Harasta, 2012; Grothe, 2013), bonds (Reisen, von Maltzan, 1999; Kraussl, 2000; Steiner, Heinke, 2001; Baum, Karpava and Schafer 2013) and share prices. The last of the mentioned type of securities will be analysed in this article.

The last trends in the European Union regulations connected with the credit rating agencies activity relies on the reduction of the oligopoly of the three biggest credit ratings agencies: Standard &Poor's, Fitch and Moody's Investor Service. The proposed regulations are based on the classification of the CRAs into the small and big ones. As small ones have less than 10% of the total market share. The mentioned changes are going to introduce the obligation to have at least two notes, where at least one will be given by the small CRAs. As a result it can be questioned if the credit ratings proposed by the less recognizable and smaller credit rating agencies will be important in taking decisions by investors.

The presented researches and practical analysis of the financial market encouraged to bring the goal of the article, that is to analyse the impact of credit ratings

changes on the rates of return of banks' shares taking into account the level of economy development and the political divisions. There are put the following hypotheses: The banks' share prices react stronger on the credit rating changes in developed economies. The strongest impact of the banks' credit rating changes is observed for a downgrade both in developed and developing economies. The banks' share prices are more sensitive on the credit ratings proposed by the recognizable credit ratings agencies. As a result the analysis has been prepared based on the data from years 1980 to 2015 for 24 European countries by using the event study methods. Data for the analysis have been collected from the Thomson Reuters Database. As a dependent variable are taken into consideration daily differences between the logarithmized rates of return of banks' shares. As independent variables are threaten long term issuer credit rating changes proposed by small and big recognizable credit rating agencies. To the best of the author's knowledge, research on the impact of changes in credit ratings offered by the small agencies have not been presented before.

The remainder of the paper is organized as follows. Section 2 presents the literature review of the impact of credit rating changes on the abnormal rates of return of shares. The section 3 is the data and descriptive statistics, including the methodology analysis. Section 4 describes the results of exploring the relation between rating changes and changes in share prices. It also tests for the differences between the impact of downgrades and upgrades, between the political and the level of the economic development, as well as discussing them. The last part are conclusions.

1. Literature Review

The current researches focuses on the impact of the credit ratings changes on the securities like bonds, CDS, shares and interest rates or exchanges rates. In the paper has been analysed the impact of banks' credit rating changes on the abnormal rates of return of their share prices, taking into account the place of the banks' activity (especially the level of the economic development and the political divisions) and the size of the credit rating agencies. The researches about the impact of the announcement of notes can be divided on the following groups:

- connected with the impact of credit rating changes on the share prices,
- analyses the impact of the watch list of credit ratings changes on the shares market,
- verify the influence of the adjustment of credit rating changes on the shares market,
- the moment of reaction (before, during and after the announcement moment) of the abnormal rates of return of shares,
- the reaction on the upgrades or downgrades of credit ratings.

Griffin and Sanvicente (1982) investigated the stock price reaction to credit rating changes proposed by Moody's and S&P's from 1960 to 1975. They analysed 180 credit rating changes. They used an event window of one year and explore the price changes eleven months preceding the credit rating change and the month during the event, before the event and also the month after the event date. As a result they have taken into consideration the monthly abnormal stock returns. The result received by them, suggests that the significant impact of the upgrades of credit ratings is not observed, but financial market reaction is negative after downgrades. The event window taken by them was too big, because financial markets react faster on the publication of significant information. The daily rates of return have been taken into analysis by Holthausen and Leftwich (1986). They have analysed 1014 credit rating changes between years 1977 and 1982, proposed by Moody's and S&P. They verified also the impact of 256 credit watches proposed by S&P. They found that the significantly negative reaction after downgrades is observed, but no significant abnormal performance for upgrades. The next analysis has been proposed by Hand and others (1992). They also confirm the significant impact of the downgrade of the credit ratings on the share prices. Goh and Ederington (1993) analysed the daily abnormal stock returns as an effect of Moody's credit rating changes during 1984 – 1986. They observed the significantly negative returns for downgrades due to earnings deterioration and positive abnormal returns for downgrades due to increased leverage.

Matolcsy and Lianto (1995) explored the impact of rating reviews in Australia proposed by Standard & Poor's from 1982 to 1991 by using weekly stock price data. The results show that only bond rating downgrades contain significant

cumulative average abnormal returns. Barron, Clare and Thomas (1997) concentrates on the credit rating changes on the UK stock prices by using daily data for years 1984 to 1992. They observed the significant impact of the downgrades and credit watch announcements. The results also suggest that the profits of companies having a credit rating do not come in the way of significant decreases in the cost of equity capital. Elayan, Hsu and Meyer (2003) investigated credit rating changes announcements for New Zealand companies. They have observed that for New Zealand market the significant impact is from upgrades and downgrades of credit ratings. They conclude that a credit rating change contains information for investors in a small and possibly neglected market. Linciano (2004) analysed stock price returns to credit rating changes proposed by the three biggest credit rating agencies for Italian listed companies for a sample of 299 credit rating changes. He divided the full sample into the subsamples according to the direction of the credit rating changes, the presence of concurrent news, the sector of the issuer. Significant abnormal returns are observed for negative watches and for downgrades. Linciano also found that the negative abnormal returns are lower for financial firms than for other companies. Poon and Chan (2007) analysed the Chinese market by taking into consideration the size of the company and the sector. Hun Han et al. (2008) examined stock market reactions to credit rating changes in emerging market countries included in the MSCI Emerging Market Index. They found there exists cumulative abnormal returns both for downgrades and upgrades.

The first researches based on the banks' credit ratings has been prepared by Schweitzer and others (1992). They investigated whether ratings changes are different for banks. They have assumed that banks react in a different way on the credit ratings changes than corporates, because they are well supervised. They also suggested that the high level of the regulation can increase the public information available for the financial market. Their results show small significant impact on stock prices around the announcement of credit rating changes. The rates of return as a result of the downgrade of credit ratings are lower of 1.5 % and this compared with pre-announcement excess returns in the order of 10-20%. The upgrade results higher rates of return by 1%. The bank regulators do hold back negative information, and that bond rating agencies have a role in generating adverse information about banks to the capital market.

The next researches were proposed by Gropp and Richards (2001), who investigated European banks' rating change announcements by three biggest agencies for 186 events from the period 1989 to 2000. They found that the information about the upgrade of credit ratings causes the increase the abnormal returns of 1.2% on the announcement day and 1.5% in the 3-day event window.

Bremer and Pettway (2001) studied the effect of downgrades for Japanese banks on share prices. They suggested that during the event window and the post-event window the significant abnormal returns are not observed. Only for the long period of time, because by taking the mean from 2 years, were negative and statistically significant of the impact of downgrade of credit ratings at 20.6%.

Calderoni and others (2009) analysed the Moody's banks' credit rating changes on stock markets for the period 2002 to 2007. The findings illustrate significant cumulative abnormal returns for downgrades in a two day window and during the event window. The upgrades do not influence significantly on the abnormal rates.
Existing research shows that abnormal return performance for smaller companies (e.g. Bernard and Thomas, 1990; Fama, 1998). Han, Shin and Reinhart (2008) conducted a multivariate regression and found no significant results for the company size effect.

Kräussl (2003) analysed the impact of the credit rating changes on the rates of return of shares during the financial crisis. As a financial crisis he took the Asian crisis of 1997-1998 and he checked how the information published in the mentioned time impacted on the stability in emerging market economies. In the case of the downgrade of credit ratings, credit watches and rating outlooks a stronger impact than positive adjustments is observed. He also received the result according to which the emerging economies react weaker on the credit rating changes. The analysis of the impact of credit rating changes in GIIPS and BRIC countries during the European Sovereign Debt Crisis of 2009-2013 has been proposed by Paterson and Gauthier (2013). They found that the negative reviews impact more significantly than actual downgrades. The upgrade of credit ratings are unimportant for the abnormal rates of return. The S&P's announcements carry more weight in the stock markets than other notes proposed by Moody's and Fitch

Investor Services. The analysis also shows an evolution of the CRA's impact throughout the crisis, with decreasing effects towards the second half of the period of interest.

Hiu, Nuttawat, Puspakaran (2004) observed that the rating assignments, positive outlooks and affirmations announcements influence on the share prices in the long-term and short-term. There is a significantly positive (negative) market reaction to the upgrade (downgrade) announcements. For the downgrade and negative outlook announcements, the short-term returns show no significant reaction but long-term returns show a significant negative response. In a small but liquid stock market like the Swedish share market, credit rating agencies only provide limited informational value to the investors.

In the research proposed by Vassalou and Xing (2003) attention has been paid to the size of the capital market, the level of development of the economy and the probability of default. They observed that the important moment for the abnormal rates of return is the moment before and after the publication of the information about the changes. The division of the sample into subsamples according to the level of the economy development may explain the differences in the previous researches.

Almeida, Cunha, Ferreira and Restrepo (2014) analysed the effect of the Big Three sovereign credit rating downgrades on firm investment and financial policy on companies from 80 countries for the 1990-2012 period. The sovereign downgrades lead to greater decreases in investment and leverage of companies that are at the sovereign rating bound relative to otherwise similar companies below the bound. Consistent with a contraction in capital supply, bond yield spreads of firms at the bound increase relative to companies below the bound.

Jones and Mulet-Marquis (2014) analysed the abnormal rates of return associated with credit rating changes of US banks. They found that short-term abnormal returns are exhibited to both upgrades and downgrades. They also suggest that US domestic banks experience significantly larger negative abnormal returns to downgrades than international banks listed in the US.

Doherty, Kartasheva, Phillips (2012) analysed the competition between credit rating agencies on the information content of ratings. They used Standard and Poor's and A.M. Best to verify the impact of entry on the information content of ratings. The empirical analysis reveals that S&P required higher standards to assign a rating similar to the one assigned by A.M. Best and that higher-than-average quality insurers in each rating category of A.M. Best chose to receive a second rating from S&P.

The presented literature review suggests that the share market reacts on the downgrades of credit ratings. The analysis proposed by Vassalou and Xing (2003) suggest that an important determinant of the credit rating changes may be the level of the economy development. As a result the following hypothesis is proposed: The banks' share prices react stronger on the credit rating changes in developed economies. The strongest impact of the banks' credit rating changes is observed for downgrades both in developed and developing economies.

The current regulation analysis suggest that issuers should take at least one note proposed by the smaller credit rating agencies. As a result a research question arises as follows: Do the credit rating changes proposed by small CRAs impact significantly on the abnormal rates of return of banks' shares?

The previous analysis has not been verified the impact of the credit ratings changes on the rates of return of shares by taking into consideration the political division criteria. In the Author's opinion the particular countries or group of countries can characterize the similar business cycle, as a result banks' shares in those countries can react the same. As a result the following hypothesis is proposed: The impact of banks' credit rating changes on the abnormal rates of return of banks shares may depend on the political division criteria.

In the next section is presented the methodology and data description that are taken into consideration during the verification the mentioned hypothesis.

2. Methodology

The basic goal of the article is to analyse the impact of credit ratings changes on the rates of return of banks' shares taking into account the level of economy development and the political divisions. The analysis has been prepared on Thomson Reuters Database. As a dependent variable are taken into consideration daily differences between the logarithmized rates of return of banks' shares. As an independent variables are the threat of long term issuer credit rating changes proposed by small and big recognizable credit rating agencies[1]. The analysis has been prepared for data from years 1980 to 2015 for 24 countries[2] by using event study methods.

The sample has been divided into subsamples according to the political division criteria, as follows: the European countries, countries that do not belong to the European Union, the Eurozone countries, countries that not belong to the Eurozone, the Central and Eastern Europe countries, and those that do not belong to the CEE area. The next division that has been proposed for countries according to the level of the economy development. The classification of the countries activity has been prepared according the division proposed by the World Bank. The grouping of countries has been presented in the **Table 1**.

[1] AK&M Long-term Issuer Rating, Dominion Bond Rating Service (DBRS) - Long-term Issuer, ER Long-term Issuer National Scale Rating, Fitch Long-term Issuer Rating, R&I Long-term Issuer Rating, RA Expert Long-term Issuer Rating, RAM Long-term Issuer National Scale Credit Rating, RusRating Long-term Issuer National Scale Rating, S&P Long – Term Issuer Rating, Moody's Long -Term Issuer Rating.

[2] Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Netherland, Norway, Poland, Portugal, Russia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, Great Britain.

Table 1: Country groups singled out according to financial development and political division criterion.

No	Country	EU	EURO	CEE	High OECD	High non OECD	Middle	Low
1	Austria	1	1	0	1	0	0	0
2	Belgium	1	1	0	1	0	0	0
3	Bulgaria	1	0	1	0	0	1	0
4	Croatia	1	0	1	0	1	0	0
5	Czech Republic	1	0	1	1	0	0	0
6	Denmark	1	0	0	1	0	0	0
7	Finland	1	1	0	1	0	0	0
8	France	1	1	0	1	0	0	0
9	Germany	1	1	0	1	0	0	0
10	Greece	1	1	0	1	0	0	0
11	Hungary	1	1	1	1	0	0	0
12	Ireland	1	1	1	1	0	0	0
13	Netherlands	1	1	0	1	0	0	0
14	Norway	0	0	0	1	0	0	0
15	Poland	1	0	1	1	0	0	0
16	Portugal	1	1	0	1	0	0	0
17	Russia	0	0	1	0	0	1	0
18	Slovakia	1	1	1	1	0	0	0
19	Spain	1	1	0	1	0	0	0
20	Sweden	1	0	0	1	0	0	0
21	Switzerland	0	0	0	1	0	0	0
22	Turkey	0	0	0	0	0	1	0
23	Ukraine	0	0	1	0	0	0	1
24	United Kingdom	1	0	0	1	0	0	0

EU – European Union countries, *EURO* – Eurozone countries, *CEE* – Central and Eastern Europe countries, *high OECD* - high – income OECD members, *high non OECD* - high – income non OECD members, *middle* - middle income economies, *low* - low – income economies.

Source: Own elaboration.

The analysis has been prepared by using the event study methods. The basic goal of the mentioned method is to verify the response of the rates of return of banks' shares on the credit rating changes in the short term period of time. The research has been performed for the three period of times by using the cumulative rates of returns. The first period relies on the verification of the abnormal rates during the pre – event window. This window consists on the abnormal rates of return changes from 31 to 2 days before the event. The event period provides five days starting from one day before the event date and ending on third day after it. It allows us to catch better absorption of news, which may be appropriate because some credit rating changes were unprecedented. The post event window represents thirty days after it. The methodology of event study requires aggregation of the abnormal differences in variable within each event window to construct cumulative abnormal differences (CAD), taking an assumption that none other factors occurred in that time.

For each of political and the level of the economy subsamples upgrades and downgrades of credit rating assessments are tested separately. The significance of the impact of the mentioned credit rating changes is verified by using t- Student test. Small number of observations may weaken the power of statistical tests, suggesting the need to consider both the economic and statistical significance of results.

The number of banks' credit rating changes in European countries has been presented in the **Table 2**.

Table 2: Number of upgrades and downgrades of banks' credit ratings in European countries.

Country	Number of upgrade of banks' credit ratings	Number of downgrade of banks' credit ratings
Austria	0	9
Belgium	2	4
Bulgaria	0	4
Croatia	0	3
Czech Republic	8	4
Denmark	9	10
Finland	7	0
France	10	46
Germany	0	24
Greece	10	33
Hungary	2	4
Ireland	9	17
Netherlands	0	16
Norway	3	3
Poland	4	10
Portugal	4	16
Russia	13	25
Slovakia	9	4
Spain	26	59
Sweden	0	23
Switzerland	9	10
Turkey	21	13
Ukraine	6	3
United Kingdom	13	49
The size of credit rating agencies		
SMALL CRA's	11	17
BIG CRA's	182	362

Source: Own elaboration.

3. Findings

The importance of the banks' credit rating changes on the banks' share prices has been analysed into three subsamples. The first one relies on the classification of the credit rating agencies according to the size and recognizability. There are divided into "big" to which belong Standard &Poor's, Fitch and Moody's Investors Service and "small" that includes the rest of credit ratings agencies. The analysis has been prepared for the upgrade and downgrade of notes proposed by the mentioned institutions. The results have been presented in the table 3. In the case of the upgrade of the assessment note it is observed the significant impact of the mentioned variable on the banks' rates of return. Before the big CRAs publish the information about the changes the abnormal rates rise by 49,6%. Then, during the event window the influence is weaker and it equals 11,7%. The strongest reaction of the banks' share prices is noticed after the publication. The rates of return rises by 54%. The received results suggest that investors cautiously approach growth expectations of a credit rating. Only after their publication are they willing to purchase securities.

In the case of the downgrade of the credit ratings the impact of the assessment notes is stronger than for the upgrade. The share market reacts on the information published by the big CRAs. The abnormal rates of returns are lower before the moment of publication by 131,1%, during the event window by 22,7% and by 105,5% after the information is provided to the public. The analysed reaction is statistically significant during the post event window by 222,1%. The presented analysis suggests that investors have higher trust in the bigger recognizable credit rating agencies. If investors predict any negative changes on the financial market they react stronger before the moment of publication of them. The mentioned situation is consistent with the Fama conception of the effective market.

Table 3: The impact of banks' credit ratings on the rates of return due to the size of a credit rating agency.

Division	Big credit rating agency	Small credit rating agency	Big credit rating agency	Small credit rating agency
	upgrade		downgrade	
Obs	182	11	362	17
Event Window				
_cons	0.117**	-0,0721	-0.227***	0,0056
t	-3,29	(-0.30)	(-4.36)	-0,03
Pre Event Window				
_cons	0.496**	-4,609	-1.311***	-3,429
t	-2,71	(-1.18)	(-4.82)	(-2.10)
Post Event Window				
_cons	0.540**	-4,623	-1.055***	-2.221*
t	-3,06	(-1.16)	(-4.02)	(-2.48)
***, ** and * denote significance at 0,1%, 1% and 5% respectively.				

Source: Own calculations.

The next part of the analysis was to verify the impact of banks' credit rating changes on the rates of return of banks' shares by taking into consideration political division criteria. The research has been presented for banks operating in the European Union, the non – European Union, the Eurozone, the non - Eurozone, the Central and Eastern Europe and the non CEE countries. It has been prepared pooling for each of the mentioned groups, both for the upgrade and downgrade of credit ratings. The first research has been prepared for the upgrade of the assessment notes. The result of the analysis is presented in the table 4. The strongest impact of the notes is for banks' that operating outside the European Union. The share prices react during the event window. The rate of return rise by 26,5%. The same situation is observed for banks that are active in countries outside the Eurozone, but the mentioned relationship is weaker (as a result of the published information about the credit ratings upgrade, the differences between the logarithmized rates of return of banks' shares increase by 15,9%). The other relationship is observed for the banks from countries outside the Central and

Eastern Europe. The abnormal rates of return rises before the moment of publication by 41,7%, during the event window by 8,86% and during the post event window period of time by 58,6%. The impact of credit rating changes in the subsamples defined as European Union banks', the Eurozone banks', the Central and Eastern Europe banks', is statistically insignificant.

Table 4: The impact of the upgrade of banks' credit ratings on the rates of return due to the political division criteria.

Division	EU	non EU	EURO	non EURO	CEE	non CEE
Obs	137	56	79	114	53	140
Event Window						
_cons	0,0407	0.265**	0,0285	0.159**	0,151	0.0886*
t	-1,26	-2,84	-0,57	-3,19	-1,71	-2,4
Pre Event Window						
_cons	0,135	0,377	0,0557	0,309	-0,353	0.417**
t	-0,94	-0,41	-0,28	-0,66	(-0.37)	-2,62
Post Event Window						
_cons	0,121	0,553	0,0116	0,409	-0,652	0.586**
t	-0,73	-0,61	-0,06	-0,88	(-0.71)	-3,16
EU – European Union countries, *non EU* – countries that do not belong to the European Union, *EURO* – Eurozone countries, *non EURO* – countries that do not belong to the European Union, *CEE* – Central and Eastern Europe countries, *non CEE* – countries that do not belong to the Central and Eastern Europe area. ***, ** and * denote significance at 0,1%, 1% and 5% respectively.						

Source: Own calculations.

The next analysis has been prepared for the influence of the downgrade of banks' credit ratings on the differences between the rates of return of banks' shares. In the subsample of European Union banks and those that operating outside the European Union the significant impact of the information about the credit rating changes on the rates of return of their shares is observed. During the pre-event window period of time the abnormal rates are lower by 183,7%. On the event window the mentioned variable is decreased by 32,3%, and after the publication falls down by

150,6%. The stronger impact is observed for the Eurozone pooling. The rates of return are lower respectively by 196,8%, 32% and 157,8%. The share prices of banks that are operating outside the European Union react only during the moment of publication. The rates of return are declined by 31%. In the subsamples of banks that are taken the activity in the non – European Union countries and the Central and Eastern Europe, the significant abnormal rates of return are not observed as an effect of the banks' credit rating changes. The last group of banks' whose share prices react significantly on the credit rating changes. The mentioned relationship is weaker and it is properly 135,3% before, 24% during and 121,5% after the moment of publication.

The described effects can suggest that share prices of banks operating in the Eurozone countries are sensitive on the information about the downgrade of banks' credit ratings. The mentioned relationship may be connected with the level of developed of financial markets.

Table 5: The impact of the downgrade of banks' credit ratings on the rates of return due to the political division criteria.

Division	EU	non EU	EURO	non EURO	CEE	non CEE
Obs	315	64	222	157	74	305
Event Window						
_cons	-0.323***	0.310*	-0.320***	-0,0702	-0,118	-0.240***
t	(-6.26)	-2,26	(-5.14)	(-0.85)	(-0.74)	(-4.91)
Pre Event Window						
_cons	-1.837***	0,717	-1.968***	-0,611	-1,623	-1.353***
t	(-7.15)	-0,76	(-6.11)	(-1.32)	(-1.64)	(-5.73)
Post Event Window						
_cons	-1.506***	0,859	-1.575***	-0,445	-0,662	-1.215***
t	(-5.67)	-1,24	(-5.15)	(-1.04)	(-0.82)	(-4.93)

EU – European Union countries, *non EU* – countries that do not belong to the European Union, *EURO* – Eurozone countries, *non EURO* – countries that do not belong to the European Union, *CEE* – Central and Eastern Europe countries, *non CEE* – countries that do not belong to the Central and Eastern Europe area.
***, ** and * denote significance at 0,1%, 1% and 5% respectively.

Source: Own calculations.

As a result of previous effects there is prepared the analysis on the last pooling. The impact of the banks' credit ratings changes on the abnormal rates of return of banks' shares in the subsamples according the level of the economy development has been examined. It has been taken into consideration with the division used by the World Bank. There are prepared the following poolings: the high – income OECD members, the high – income non OECD members, the middle income economies and the low – income economies. The verification has been made both for the upgrade and the downgrade of credit ratings. The effects of the estimation of the mentioned relationship has been presented in the **Table 6**.

The impact of the upgrade of the banks' credit rating has been made for the high – income OECD members, the middle income economies and the low – income economies. The significant influence of the mentioned change is observed for the post event window period of time. The abnormal rates of return of banks' shares are higher by 27%. The stronger effect of the banks' credit ratings changes has been noticed on the abnormal rates of return of shares of banks that are operating in the middle income countries. The rates of return rise by 36,9% during the event window and 155,6% after the publication of the information about the changes. The analysis prepared for the prices shares of banks active in the low income countries, has given statistically insignificant results. The received applications confirm earlier results obtained in the study.

The last part of the research has been to verify the impact of the downgrade of banks' credit ratings presented in the subsample according to the level of the economy development. The received results suggest that only the shares of banks' operating in the high income OECD countries are sensitive on the downgrade of the assessment notes. In the pre-event window period of time the rates are lower by 184,4%, during the moment of publication they are decreased by 31,5% and after the announcement of changes they are fall down by 142,5%. The financial markets both according to the level of economy development and the political divisions, react stronger on the downgrade of the credit ratings than on the information about the upgrade. The presented analysis suggests also that shares market in the middle income economies is insensitive on the announcement of the downgrade of the

banks' credit ratings, because the abnormal rates of returns of their shares have risen despite the publication of a negative change.

Table 6: The impact of the of banks' credit ratings on the rates of return due to the level of economy development.

Division	high OECD	middle	low	high OECD	high non OECD	middle	low
	upgrade			downgrade			
Obs	151	35	6	331	3	42	3
Event Window							
_cons	0,0584	0.369**	-0,193	-0.315***	0,0992	0.279*	3,466
t	-1,92	-3,06	(-0.41)	(-6.34)	-0,63	-2,24	-2,75
Pre Event Window							
_cons	0,176	0,847	-2,859	-1.844***	0,479	0,219	22,24
t	-1,26	-0,83	(-0.43)	(-7.44)	-0,99	-0,24	-2,64
Post Event Window							
_cons	0.270*	1.556*	-7,978	-1.425***	0,988	0,15	14,28
t	-2,07	-2,19	(-1.09)	(-5.52)	-0,7	-0,23	-1,84
high OECD - high – income OECD members; *high non OECD* - high – income non OECD members; *middle* - middle income economies; *low* - low – income economies. ***, ** and * denote significance at 0,1%, 1% and 5% respectively.							

Source: Own calculations.

Conclusions

The presented research suggests that in most cases the credit ratings are given by the bigger, recognizable credit ratings agencies. The issuers are not interested by taking notes proposed by the smaller CRAs. The mentioned situation is connected with the quality of credit ratings and the reputation of CRAs. The issuer that received notes from the Big Three are threatened as those more serious and less risky for the investor.

The basic goal of the paper has been to analyse the importance of the banks' credit rating changes on the banks' share prices has been analysed. The verification has been prepared into three subsamples, according to: the size and recognisability of CRAs, the political divisions and the level of the economy development. The analysis has been prepared for the upgrade and downgrade of notes proposed by the mentioned institutions. The upgrade of banks' credit ratings influence significantly on the rates of return only in the case of the big agencies. In the case of the downgrade the impact of the assessment notes is stronger than for the upgrade. The analysed reaction is statistically significant both for the notes proposed by small and big CRAs, but the moment of impact is different. The share prices on the big CRAs notes react before, during and after the announcement moment. On the other hand the investors take decisions, under the influence of a change of notes given by small CRAs, only after the moment of publication.

The next analysis has been prepared for the political divisions. The first research has been prepared for the upgrade of the assessment notes. The mentioned change is significant for the rates of return of shares of banks operating outside: the Eurozone, the European Union and the non CEE area. The downgrade of notes is important for shares market of banks operating in: the European Union, the Eurozone and the non CEE area. The described effects can suggest that share prices of banks operating in the Eurozone countries are sensitive on the information about the downgrade of banks' credit ratings.

The analysis of the impact of the level of the economy development on the mentioned relationship. The impact of the upgrade of banks' credit rating changes on the abnormal rates of return of banks shares is significant for shares of banks' operating in the middle income countries. The downgrades of credit ratings influence significantly on the rates of return of shares of banks' that take activity in the high income OECD countries.

In conclusion, the banks' share prices react stronger on the credit rating changes in developed economies and the upgrade – in the middle income economies. The credit rating changes proposed by small CRAs impact insignificantly on the abnormal rates of return of banks' shares in the case of the upgrade and are

important for the downgrades. The impact of banks' credit rating changes on the abnormal rates of return of banks shares depends on the political division criteria.

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Introduction

Science, technology and innovation networks gain momentum in the policy agenda of the member states of the European Union. Policies to strengthen research, innovation and deployment activities mainly based on public funding. However, only providing public funding without suggesting strategic policies to strength joint project networks will not be sufficient to create competitive power. In this study, proximity types between participants and network positions of participants in the seventh Framework Programme (FP7) will be explored to suggest strategic network policy to enhance the competitive power of projects in European Commission. Using a large number of data, Social Network Analysis Methodology will be conducted to examine both the structure of FP7 network and explore the relations between participants in the network. The study will be novel in terms of its depth data analysis technique and conducting a research from the key aspects of network performance.

1. Framework 7 Programme

According to European Union's Lisbon strategy, knowledge, research and innovation are the heart of the setting dynamic and competitive power. Therefore, FP7 is built to provide strong networks to facilitate knowledge transfer among participants. The main idea behind FP7 is facilitating effective networks because Networks serve as a locus for innovation, because theyprovide more timely access to external knowledge and resources, represent a test for internal expertise and learning abilities, and give better monitoring and control over fast-moving developments (Powell et al., 1996).

European Research Area (ERA) implement main policy tool which is FP to support research and diffusion, facilitate circulation of information and knowledge, development of transnational organizational forms, definition of common standards, the promotion of shared values.[1] FP7 is different from other first 6

[1]ftp://ftp.cordis.europa.eu/pub/fp7/docs/potential-activity-report_en.pdf

framework programmes in terms of budget and participant types. First five framework programmes provide construction of complex networks with structural properties that facilitate dissemination by constructing recurring patterns of collaboration. In the sixth framework programme Information society technology programmes played an important role in generating and diffusing knowledge as they manage to attract key industry players and boosted network connectivity. Therefore, FP7 is different from other framework programs in terms of including individual teams rather than institutions, universities and private firms. It is crucial to analyze that to investigate social network analysis to detect who are hubs and gatekeepers in knowledge transfer.[2]

1.1. Why Social Network Analysis?

To begin with Social Network Analysis (SNA) is a descriptive social science methodology that maps, measures, and finds patterns in the connections between people and/or organizations.(Johnson, Honnold and Stevens, 2010). Buch-Hansen (2013: 6) criticizes if SNA is detached from positive science and it is mainly used by contemporary scholars in a deductivist manner to test hypotheses derived from theory. Furthermore, it is mainly criticized because of having positivist methodology by including deductive use of theory, reductionist formal models in order to predict and generalize a combination like rational choice theory. (Buch-Hansen, 2013: 16). However, Buch, Hansen (2013) concludes that it is well connected to social world to analyze the unobservable objects (relations) keeping in mind that knowledge is "social and fallible product". As it is well known that social sciences are for criticizing the phenomena and questioning the hidden parts of what is unclear and trying to understand the processes. Therefore, it depends on the researchers' ability to apply SNA in both positivist and non-positivist ways.

[2]ftp://ftp.cordis.europa.eu/pub/fp7/docs/seg-final_en.pdf

In this study, SNA will be used for analyzing connections among participants in 7th Framework Programme. SNA is the most suitable methodology for this study because of following reasons:

- Social network analysis (SNA) is significant when there is no missing data or link in the data. Therefore, the data collection which is done by interview techniques will be less sufficient for SNA. In this study, the data is collected from CORDIS database so the quality of data is appropriate for SNA.
- The probability technique is advanced in SNA, which means it calculates the relationship between actors by coincidence, or not. Therefore in this study, if a country mostly works with a specific participant type, it can be detected it is by coincidence or not.
- SNA methodology is based on relationship between actors not on the actors themselves. Since the FP7 programme is depending on the networking relations of participants, the meaning of ties, connections, and patterns can be analyzed by SNA.
- SNA is a powerful tool for visualizing network. It also has a flexible methodology to change network size, actors and other nodes to create different visualization to make different inferences.

1.2. Aim of this study

The main purpose of this study is to make a policy recommendation to strengthen joint projects between European and non-European countries. According to the results of analysis of this study, it will be found which participant types and countries are crucial in the network. Moreover, it will be analyzed which countries make projects according to which proximity types. After social network analysis of network, it will be depicted that which country choose to work with as a project participant, project coordinator or participant type. Each country's preferences will be different or there can be generalization of preferences. These results will be seen after social network analysis. Their preferences will be examined according to proximity types. Therefore, the purpose of this study is to analyze which countries,

which participant types play crucial role in the framework 7 programme. In addition, with accordance to outcomes the policy recommendation will be suggested by implementing appropriate policy tool to strength network in this programme.

Research questions for this study are declared in the following:

- Exploring network position of project participants how and what can be done to increase network connectedness.
- Exploring proximity types among project participants in the top projects in the 7th Framework Programme.
- Exploring determinants of successful network policy to enhance performance of European Commission projects.

2. Literature Review

2.1. Recent Studies Framework Programmes by Using Social Network Analysis

The whole name of FP7 is 7th Framework Programme for Research and Technological Development. It last for seven years from 2007 until 2013. The programme has a total budget of over € 50 billion which has the highest one compared to other framework programmes in order to show the importance of research in Europe.[3] However, only providing public funding to the participants does not spontaneously result in boosting the strength of European innovation, knowledge and technology triangle. These findings firstly provide benefits to the participants then with the knowledge transfer among firms by making collaborating projects should result in overall success in the network.

Similarly; Breschi, Cassi, Malerba and Vonortas (2009) states that R&D expenditures depend on public funding provides firms input additionality

[3]http://ec.europa.eu/research/fp7/pdf/fp7-inbrief_en.pdf

(resources added to system), output/outcome additionality (extra private and social returns), behavioral additionality (improving the competencies, capabilities, organizational structures and strategies of firm). Most innovations involve collaboration of several different organizations and in these organizations; there are diverse kinds of formal contracts but also informal exchanges of knowledge.

Autant-Bernard and Chalaye (2013) analyzes knowledge diffusion between EU and ENC countries from the important channels such as: IPR Collaboration, student mobility, co-authorship and co-inventorship. These channels are found that they are significant in knowledge diffusion. On the other hand R&D cooperation is an important channel for only ENC countries. Autant-Bernard and Chalaye (2013) stresses that countires have different collobation activities in FP projects, for instance Morrocco, Algeria, Belarus, Moldova have high orientation towards Europe in general but less significant orientation in FPs. ENC countires collaborate with eachother homogenously in FPs and collaboration between EU and ENC is more intense. Additionally, it is found that co-inventor and co-publication networks strongly centered around Israel and Turkey.

Furthermore, Roediger-Schluga and Barber (2006) surprisingly found out that project size does not associate with central project type; the most crucial projects are consisted of different groups in the study covered first six frameworkprogrammes. Moreover, in the large projects there were a few key actors. However, it is stressed that there is a similar pattern of the participants tend to make projects with their previous partners. Thus, the size of project does not play crucial role in the performance of framework programmes, the other significant factors should be analyzed.

There have been several important studies about firms' network position related with organizational performance. For instance, Powell et. al (1999) investigates network of relationships and organizational performance in the human biotechnology industry and found that network position of a firm has significant affect in the firm's performance. Similarly, Farina (2008) conducted a study about the network position of firms and their performance in banking industry and found

that banks enhance performance by having a central position in their network and that specialization reduces bank's benefits of having a central position in the network. Similary, Autant-Bernard and Chalaye (2013) declares that country's position in the network and overal network structure are key determinants of knowledge diffusion.

Therefore, it can be concluded that the actors in the position of hubs and gatekeepers are the most crucial actors in the network. These actors may benefit from their position in order to improve their organizational performance also they provide benefits to the other actors by creating bridges to connect with other actors.

Cassi, Corrocher, Malerba and Vonortas (2009) analyses research network and and deployment networks for IST- RTD Program in 6th Framework Project and it is not surprisingly found that higher education and research institutes are important actors in research networks while industry plays crucial role in deployment networks. Moreover Cassi et. al (2009) stresses the focus of innovation and deployment networks in regional level because it is criticized that existing studies concentrate on the effectiveness of research networks at the European level. As a result, the literature is lack of how research networks affect regional systems and how research and diffusion activities carried out at regional level. Therefore, Social network analysis is conducted to find out interaction and overlaps in the network to detect hubs and gatekeepers in evaluating the links between research and deployment networks of innovation in information society in Europe. (Cassi, et. al (2009). In order to strengthen the links between research and deployment, strengthen regional strategies for deployment of innovations, Cassi et. al (2009: 248) stresses the different roles of multinational companies, SMEs, governments to make more overlaps between research and deployment networks.

2.2. Framework Programmes Studies Related with Proximity Types

Usai, Marrocu and Paci (2013) state that technological and geographical proximities are the most significant type of proximities related to inter-firm knowledge exchanges. On the other hand spatial distance, cultural differences and

institutional and linguistic borders reduce knowledge diffusion between EU and ENC. Labor mobility, overall network structure and individual's position in network affect knowledge diffusion. Knowledge diffusion between EU and ENC can be analyzed by mobility, collaboration, and knowledge networks. Usai, Marrocu and Paci (2013) measured 5 proximity types which are Geographical Proximity, Technological Proximity, Institutional Proximity, Organizational Proximity and Social Proximity. It is stated in the **Table 1** below how they measured these proximity types.

Table1: Proximity types in networks

Proximity Types	How it is measured?
Geographical Proximity	Spatial (geographic) distance
Technological Proximity	Same industry, same sector
Institutional Proximity	Same status
Cognitive Proximity	Not measured in the study
Organizational Proximity	Same group (Participant type, same clique)
Social Proximity	Diverse geodesic distance

Source: Self-interpretation from Usai, Marrocu and Paci (2013)

Geographical proximity is measured by spatial distance between project partners. In my study, it will be done in the same manner by calculating physical distance between countries and between participants. Technological proximity is measured by identifying sector and industry type. Institutional proximity is measured by same status of participants, they give dummy variable if two participants have similar formal and informal rules, regulations and norms. Usai, Marrocu and Paci (2013) did not include cognitive proximity in their study. Organizational proximity

is measured by detecting the quantity of joint connections of participants and also if the participants have been in the same group, the dummy variable is set to 1 in their study. Social proximity is measured by shortest path between actors (nodes) meaning geodesic distance.

3. Data Analysis

Social network analysis is done by using Pajek tool with framework projects' data. The raw data contains all framework project data until the middle of the 2014. I picked energy projects from FP7, ICT projects from FP7 to analyze by social network technique. The raw data are analyzed in excel format and macro codes are written to arrange the data which is suitable for social network analysis. All data and macro codes will be available in the attachments.

3.1. Energy Network in FP7

There are 965 participants and 101 projects about energy project theme in FP7. Network is emerged by putting tie between participants in the same project. Therefore 2 - mode network is emerged between participants and projects. Project type is clustered according contract type which refers to funding type of the project.

Table 2: Contract Type of Projects

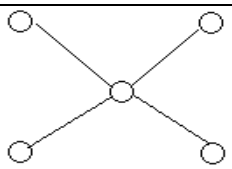
Contract Type	Cluster Number
CP-FP - Small or medium-scale focused research project	1
CP-IP - Large-scale integrating project	2
CSA-C - Coordination (or networking) actions	3
CSA-S - Support actions	4
CSA-SA - Support actions	5
CP - Collaborative project (generic)	6
CP-SICA - Collaborative project for specific cooperation actions dedicated to international cooperation	7
CSA-CA - Coordination (or networking) actions	8
BSG-SME - Research for SMEs	9
BSG-SME-AG - Research for SME associations/ groupings	10
Cooperative - SMEs-Co-operative research contracts	11
Collective - SMEs-Collective research projects	12

Participants are clustered according to country code and each country is represented as different color in Pajek visualization. Participants are clustered according to being coordinator or participant. There are two vector files for projects which are cost and funding. These vectors represent the size of nodes in the network. As the size of the node is big, it means the project has higher funding or cost. Therefore the whole energy data consists of 3 cluster files: country code of participants, contract type of projects, participant type of participants; 2 vector files: project cost, project funding.

3.1.1. Network Analysis

Metrics related to information flow and power in a network is examined in terms of degree centrality, degree centralization, closeness centrality, closeness centralization, betweenness centrality and betweenness centralization in social network analysis. In the following table, each metric is described what it means for the analysis and how it relates with network.

Table 3: Metrics related to information flow and power in a network

Metrics related to information flow and power in a network	Description	What does mean for analysis?
Degree centrality	Positions of individual vertices within the network (how many degree=ties has)	Information can reach vertices with high degree centrality easily
Degree centralization	Refers to networks (degrees of vertices divided by the maximum degree variation)	in highly centralized network information spreads easily and the vertices at the center have high importance for the transmission of information
Closeness centrality	refers to the number of other vertices divided by the sum of all distances between that vertex and all others	Vertex is distant to other vertices or not in the network
Closeness centralization	Closeness centrality of vertices divided by the maximum variation in closeness centrality scores possible in a network of same size	 This star network has highest closeness centralization=1 , equal distances to reach center vertex.
Betweenness centrality	Proportation of all geodesics(distance) between pairs of other vertices that include this vertex	How important a vertex is for transformission of information rather than how reachable it is.
Betweenness centralization	Betweenness centrality of vertices divided by the maximum variation of possible network in the same size.	Star network has the possible greatestbetweenness centrality (N-1). How much bigger betweenness centrality means that network has high possibility for transmission.

Source: Self-Interpretation (De Nooy, Mrvar and Batagelj, 2011)

Metrics' calculation of FP7 Energy Network is stated in the **Table 3** in terms of both project network and participant network. Closeness centralization cannot be calculated which means the all energy network has not homogenous distance to the center of the node. Betweenness centralization of participant network has the highest value which means there is high possibility for knowledge transmission between participants.

Table 4: Metrics' calculation of FP7 Energy Network

Metrics related to information flow and power in a network	FP7 Energy Network (All Network)
Degree centralization	0.0226 (project network = 0.07963, participants network= 0.16061)
Closeness centralization	Network is weakly connected, cannot be computed. (So I will investigate different partitions in the next section 1.1.2)
Betweenness centralization	0.20164 (project network = 0.0784, participants network= 0.20624)

Average degree of participant and project network is 2.0863039. Generally, vertices have 2 ties with each other. If we separate projects and participant network (transform 2 mode network to 1 mode network) then All Degree centralization of participant network is 0.07963. If we emerge 1 mode network of only projects and then calculate the all degree centralization then it is 0.16061.

All degree centralization refers to the network density. Project network is denser than participant network. Overall, this network is not a dense network; nodes make a few connections to each other.

To analyze deeply we need to look closely to participant network. Since closeness centralization of the whole FP7 energy network cannot be calculated, there is another measure called All Closeness Centralization Calculation (which analyze to

measure more strong ties between partitions and relatedness) is applied. In order to calculate all closeness centralization of network, 2 mode network should be separated into project and participant network. In order to test the connection between participant type and country clusters we need to calculate all closeness centralization. There are two types of cluster files which are country of participant and participant type (coordinator or just participant). The relation between these two types of cluster will be measuredby all closeness centralization and its calculated 0.31837. If the participant network closeness centralization is higher than energy network then we can make assumptions that in those networks country type and participant type is more significant than energy network.

3.1.2. In Dept Analysis of Project Network

Project network visualization is provided below in **Figure 1** according to contract type and funding. Vertices represent projects, different colors represent different contract type and size of vertices represent funding amount.

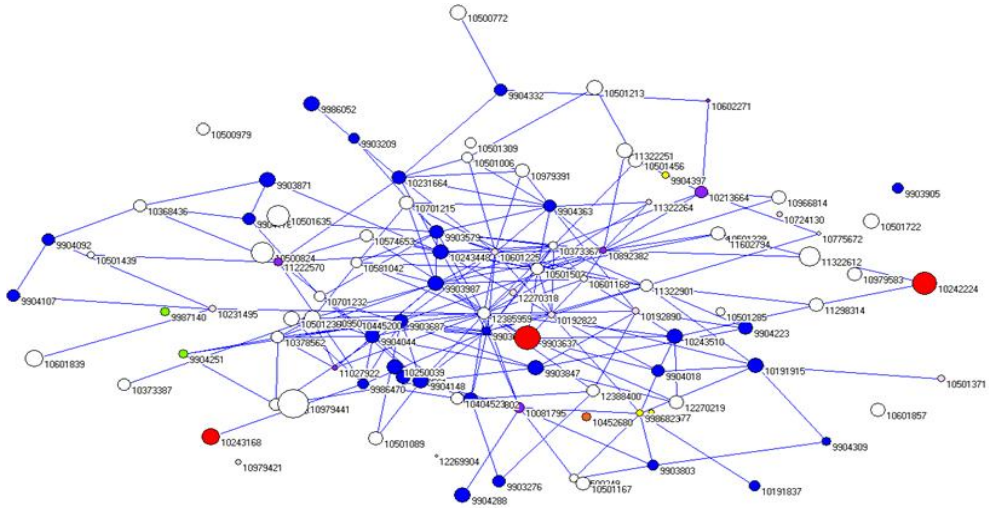


Figure 1: Representation of project network in terms of contract type and funding

The colours of different contract type is stated in the following:

- Red Vertices type: CP-IP - Large-scale integrating project
- Blue Vertices type: CP-FP - Small or medium-scale focused research project
- White Vertices type: CP - Collaborative project (generic)
- Pink Vertices type: CSA-SA - Support actions
- Green Vertices type: CSA-C - Coordination (or networking) actions
- Yellow Vertices type: CSA-S - Support actions

CSA-C - Coordination (or networking) actions projects are in the periphery of the network. Generally CP-FP - Small or medium-scale focused research project are in the center of the network thus they have high degrees compared to other types of projects. Only one CP-IP - Large-scale integrating project is located near to the center of the network.

3.1.2.1. Testing Similarities of Project Network in terms of Different Clusters and Vectors

Spearman Correlation index is used to measure different similarity of different partitions. Firstly, similarity between contract type and degree of projects is measured and Spearman Correlation index is calculated as -0.01575 which means there is no similarity between these partitions. Likely, there is no similarity between betweenness centrality of projects and funding, degrees of projects and funding and contract type and project cost because their spearmen correlation index is calculated as negatively as it is given in the table below. On the other hand there is similarity between closeness centrality of projects and funding which has highest spearman correlation index. Similar funding amount causevertices located homogenous distance to each other. There is not significant similarity result between degrees and project cost.

Table 5: Spearman Correlation Index Results

Similarity Comparison between Partitions	Spearman Correlation Index
contract type and degree of projects	-0.01575
betweenness centrality of projects and funding	-0.12168
closeness centrality of projects and funding	0.02198
degrees of projects and funding	-0.05451
contract type and project cost	-0.16766
degree and project cost	0.00814

3.1.2.2 Important Roles in the Project Network:

Bi-components of project network is found to see the projects that receives information from different two channels. Therefore obtaining bi-components of network provides to see the projects in which transmission of information most likely to be occurred. Representation of bi-components of project network is shown in **Figure 2** below.

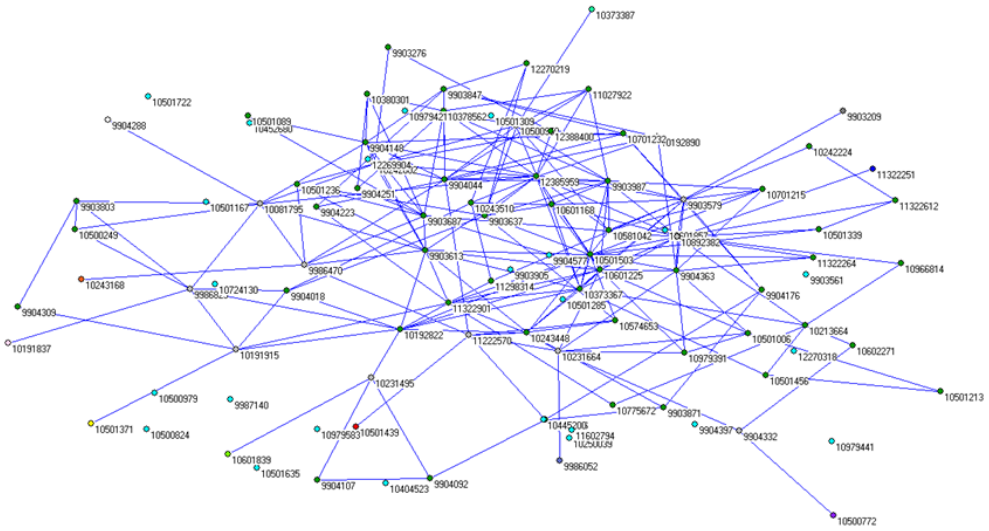


Figure 2: Representation of Bi-components

After detecting bi-component network, the projects that belongs two or more bridges or bi componentscan be found. These projects are shown with respect to contract type in the following **Figure 3**.

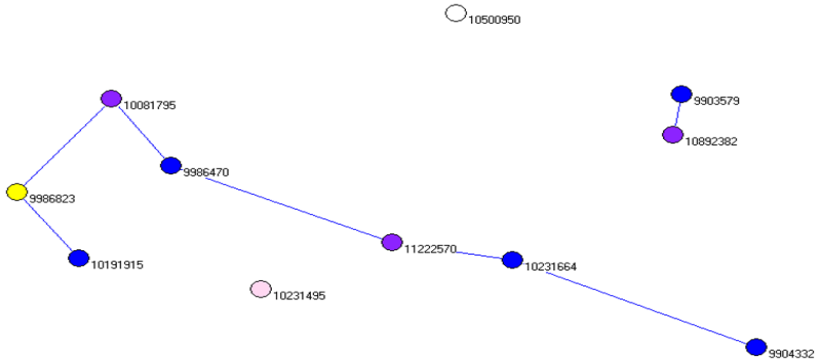


Figure 3: Representation of projects belongs two or more bridges

In the center there is CSA-CA - Coordination (or networking) actions (purple color). Yellow color project(CSA-S - Support actions type) can play brokerage role for blue project and there is structural hole between purple and blue project.

3.1.3. In-Depth Analysis of Participant Network

Participants of FP7 Energy programme with smaller and same size emerge different components which can be seen in the whole representation of network in the **Figure 4**. There are also small degrees of vertices connected to central network but they are also staying in the periphery of the network. Participant network is drawn in the below with respect to country and degree. The separate components are visualized as follows. The size of vertices represents the degree of participants (different colours shows different countries and size of vertices show degree of participant).

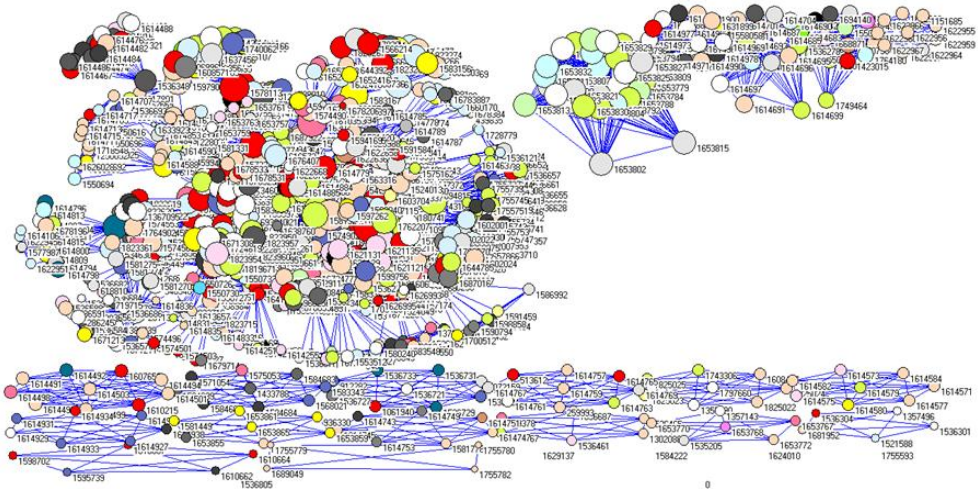


Figure 4: Representation of participant network in terms of countries and degrees

Participants with smaller size degrees are dense in the below part of network and they are separate from the center. Small size degree participants are collaborating among each other generally.

3.1.3.1 Testing similarity between country type and degree of participants:

Cramer's V. Rajskiis used to measure different similarity of different partitions.In order to investigate whether there is similarity or not between county type and degree of participants in participant network**.**Cramer's V. Rajskiindex is calculated. Cramer's V. Rajski index is significant if the index is greater or equal to 0.5 in making concrete assumptions. Index is calculated as in the following and all indexes are less than 0.5 to make a concrete assumption. However the highest index is the third one which is Rajski(C1 <- C2): 0.2410. This means there is a probability in which degree of participants is most likely similar in the participants of same county.

Chi-Square: 2774.4897
Cramer's V: 0.2351

Rajski(C1 <-> C2): 0.1351
Rajski(C1 -> C2): 0.2351
Rajski(C1 <- C2): 0.2410

3.1.3.2 Analysis of Important Roles in The Network

If there is structural hole, it means there is to tie between participants to make interaction. Larger space between vertices indicates that there is a structural hole in the network in that place. High constraint ties are drawn shorter, low constraint ties are drawn longer. In the participant network there are no bridges. The structural holes of participant network is shown in the **Figure 5** below.

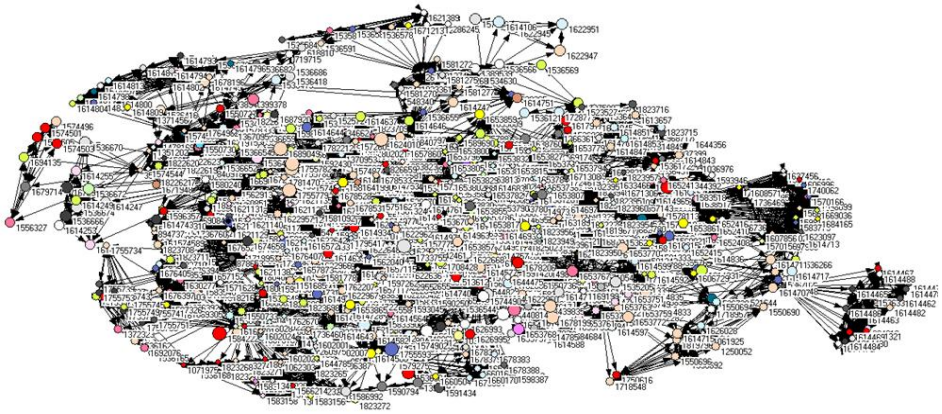


Figure 5: Representation of Structural Holes

3.2. ICT Projects in FP7

Metrics related to information flow and power in a network of FP7 ICT network is calculated as in the following **Table 6**.

Table 6: Metrics related to information flow and power in a network of ICT network

Metrics related to information flow and power in a network	FP7 ICT Network (All Network)
Degree centralization	0.00803(project network = 0.11531, participants network= 0.04412)
Closeness centralization	Closeness Centralization cannot be computed since the network is not weakly connected like in FP7 energy network
Betweenness centralization	0.08529(project network =0.04946, participants network= 0.08052)

Average degree of participant and project network is 13.6915720. All Closeness Centralization of projects cannot be calculated because it is not a dense network the ties are so weak. All Closeness Centralization of participants is 0.1406.

All Closeness Centralization between country partition and participant type partition is calculated as 0.21426 which is lower than FP7 energy network. Since the calculation of ICT network shows that this network is not dense as energy network, we do not need other calculations. In order to see analyze more deeply this network, hubs can be found. If the network is not dense, there is high probability that hubs play crucial roles in the network. Therefore, the knowledge transfer is occured among hubs.

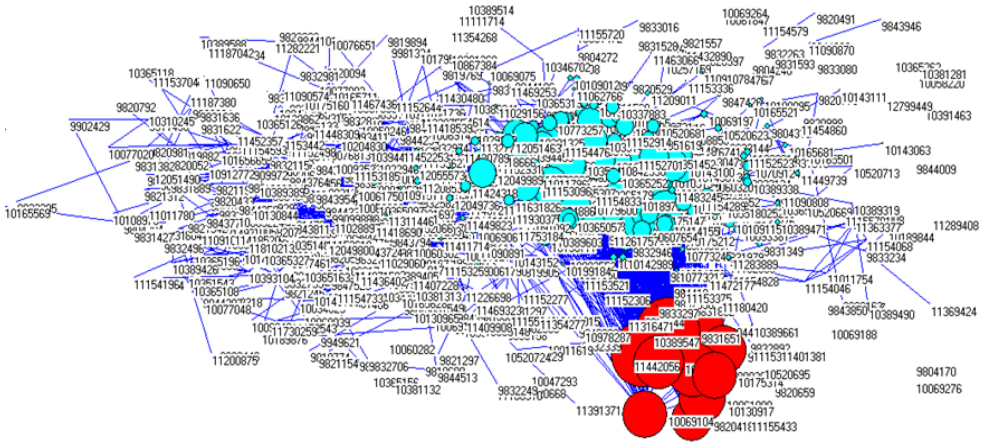


Figure 6: Hubs in the FP7 ICT Network

The colours of different contract type is stated in the following:

- Red Vertices type: CP-IP - Large-scale integrating project
- Blue Vertices type: CP-FP - Small or medium-scale focused research project

- White Vertices type: CP - Collaborative project (generic)
- Pink Vertices type: CSA-SA - Support actions
- Green Vertices type: CSA-C - Coordination (or networking) actions
- Yellow Vertices type: CSA-S - Support actions

Therefore, there is the biggest hub in the CP-IP - Large-scale integrating project also these projects has the highest funding. The second hub occurs within CP-FP - Small or medium-scale focused research project represented as blue color. There hub is also located as in the center of the network and has moderate level of funding.

Conclusion

The most significant comparison between FP7 energy and ICT networks can be summarized in terms of density of the networks, location of structural holes and hubs and project type.

Participant network closeness centralization of energy network is higher than that of ICT network so we can make assumptions that in energy participant networks country type and participant type is more significant than those of ICT network. CP-IP - Large-scale integrating projects is the center of energy network which has highest finding. However, CP-IP - Large-scale integrating projects in ICT network emerge hub among each other there is no knowledge transfer possibility with other projects. CSA-S - Support actions type projects can play brokerage role for blue project and there is structural hole between CSA-SA - Support actions and CP-FP - Small or medium-scale focused research project.

Participants with smaller size degress are dense in the below part of energy network and they are separate from the center. Small size degree participants are collaborating among each other generally.

The aim of policy recommendation will be attracting key (crucial, popular) actors to the programme network, strengthen connectivity among actors, suggesting

organizational setting, and institutional settings to the weakest actors in the network and small funding projects. Furthermore, the strategy aims to strengthen the scientific and technological network of European projects by proposing strategic suggestions in the global competitive world.

As a further study, this flexible and novel study may also be conducted to Horizon2020. Moreover, there will be comparison between framework and horizon 2020 projects and future recommendation will be drawn for further knowledge, research and innovation related programmes.

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Introduction

In a recent paper, Ferreira and Dionísio (2016) investigated how long the memory of USA stock market is. With a 20 years sample, since 1995 to 2014 (with almost 5.000 observations), they computed, sequentially, both linear and nonlinear correlations between return rates and its lags. As usual, they confirmed that linear correlations, measured by Pearson coefficient, quickly tend to zero. However, using detrended cross-correlation analysis (DCCA) and its correlation coefficient, correlations remain significant until, approximately, 150th lag. In this paper, we extend the analysis of that paper by two different ways: firstly, we use an extended panel of countries, with all the G7 countries (Canada, France, Germany, Italy, Japan and United Kingdom, besides the referred USA); secondly we also extend the sample of analysis – beginning on 1972 and ending on 2015, in a total of 11479 observations.

This kind of analysis is inserted in a great group of studies that have the objective to study the behavior of financial markets. In fact, a larger amount of studies is dedicated to the Efficient Market Hypothesis (EMH), which is one of the most important hypotheses in financial economics. According to EMH, it is not possible to identify any deterministic pattern in its time series behavior (implying that EMH is verified in its weak form if). In other words, it means that, through arbitrage, agents could not obtain systematic abnormal profits using past information (Fama, 1970).

As previously referred, we can find in the literature a large amount of studies dealing with this problem. This analysis lasts for over a century: probably the study of Bachelier (1900) is the first one that tries to explain the random walk behavior of stock prices. Although with some interval span, some other studies corroborated this important finding: Fama (1963), Osborne (1964) or Granger and Morgenstein (1964) are just some of the most important studies on this theme, in the middle of the 20th century. These and other studies stated that, when linear autocorrelation exist between return rates, they quickly disappear.

Despite the importance of linear autocorrelations, some authors argue that return rates could suffer of other kind of dependence, namely long-range dependency. In this context, this kind of dependence could be interpreted as temporal or sectional dependence in return rates which could imply some capacity to predict financial series which, if true, could violate the EMH. The possibility of other kinds of dependence is known in the literature by stylized facts. The main stylized facts found are the existence of fat tails, asymmetries in gains and losses, volatility clustering behavior, leverage effect and the existence of autocorrelation in variance. The work of Cont (2001) makes a survey on several stylized facts. But that analysis remains interesting and later studies demonstrate it (see, for example, Malmsten and Teräsvirta, 2004 or Nystrup et al., 2015). Due to the large amount of papers that analyze EMH, it is not possible to make a simple literature review on it. For a more complete literature review on EMH see, for example, the work of Sewell, 2011.

The behavior of financial markets as complex systems, with large amount of available data, attracted the attention of physicists. In recent years, the behavior of financial markets was frequently studied, using measures and methodologies with origin on statistical physics. Inclusively, a new research field was born: Econophysics. In this new field, multidisciplinary researchers are able to study economic issues, especially in financial markets. Our objective is not to carry out an extensive literature review on Econophysics. You can find some reviews in works of Jovanovic and Schinckus (2013) or Schinckus (2013), among others.

Following the methodology of Ferreira and Dionísio (2016), the objective of this paper is to analyze the behavior stock markets in the G7 countries and find which of those countries is the first to reach levels of long-range correlations that are not significant. We carry out this analysis using detrended cross-correlation analysis and its correlation coefficient, to check for the existence of long-range dependence in time series. The existence of long-range dependence could be understood as a possibility of EMH violation. This analysis remains interesting because studies are not conclusive about the existence or not of long memory in stock return rates.

1. Methodology

The main goal of this paper is to analyse the presence of long range memory in returns. This result could be related with the existence of nonlinear dependence in return rates which may not be detected with the corresponding linear tests (see, for example, Darbellay, 1998 or Granger *et al.*, 2004).

In order to evaluate the global dependence in and within returns we use a nonlinear approach based on detrended fluctuation analysis (DFA). Created by Peng *et al.* (1994), this methodology studies the behavior of individual series and has several applications to financial markets (see, for example, the work of Cizeau et al., 1997, Ausloos et al., 1999 or Ferreira and Dionísio, 2014, among others). The great advantage of DFA is the fact that it can be used on both stationary and non-stationary series, while linear approaches can only be used on the former.

Besides DFA, detrended cross-correlation analysis (DCCA) can also be used to study long-range dependence. However, DCCA is used not to study the long-range behavior of one time series but the behavior between time series, namely its long-range cross-correlation. Created by Podobnik and Stanley (2008), it has the advantage of also being used in non-stationary time series.

DCCA gives us information about cross correlation between series but does not quantify that relation. In order to make that quantification, from the results of DCCA between *x* and *y* and DFA for each series, Zebende (2011) created the correlation coefficient given by $\rho_{DCCA} = \frac{F^2_{DCCA}}{F_{DFA\{xi\}} F_{DFA\{yi\}}}$. This coefficient has the general properties of one correlation coefficient, namely $-1 \leq \rho_{DCCA} \leq 1$. A value of $\rho_{DCCA} = 0$ means that there is no cross-correlation between series, while a positive or negative value means, respectively, evidence of cross-correlation or anti cross-correlation between series.

According to Podobnik et al. (2011), we can test the significance of this correlation coefficient. We use that methodology to estimate critical points of our test, which is considered robust (see, for example, Kristoufek, 2014). We can find in the literature some papers using DCCA or its variations (where the correlation coefficient could be included) analyzing financial markets: Cao et al. (2012) or Wang et al. (2013) are just two examples.

2. Results

We used information the Morgan Stanley Capital International (MSCI) stock indexes for G7 countries, between January 1972 and December 2015, with a total of 11479 observations[1]. Data was retrieved from Datastream. We chose the same kind of index for each country (the MSCI one) to better comparison. Each index was standardized to 100 for the first observation and, after this, we calculated the return rates for them, making the traditional difference between logarithms in two consecutive moments in time, i.e., $r_t = ln(I_t) - ln(I_{t-1})$, with I_t being the value of the index at moment *t*.

Figure 1 shows the evolution of each index (on the left) and of the correspondent return rate (at the middle). At the right, we have descriptive statistics of both variables. As expected, the mean of the return rate is very near to zero.

[1] For these countries, data exists since January 1970. However, until January 1972 the information was just updated on a weekly basis.

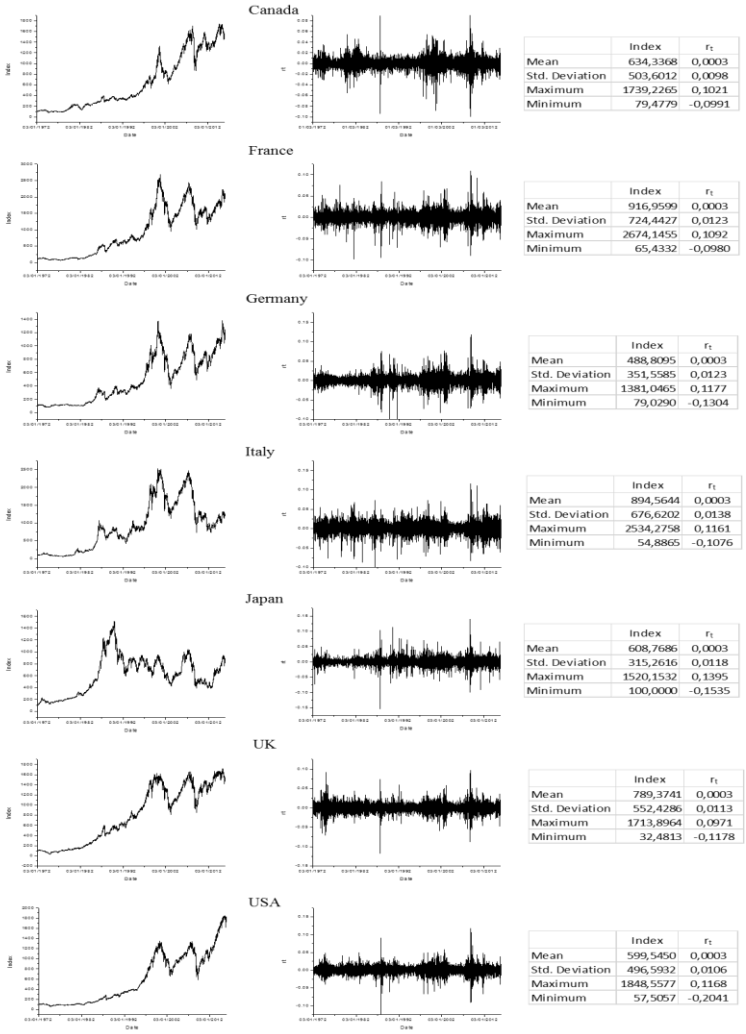

Figure 1: Stock indexes and return rates

Applying DFA to the return rate, we obtain the exponents presented on **Table 1**. Canada, France, Germany and Italy show some persistent patter, while UK and USA stock markets present some anti-persistence. The Japanese stock shows a behavior near to a random-walk. In fact, if we perform the hypothesis test for a parameter equal to 0.5, the conclusion, we do not reject that hypothesis. Some of these results are coherent with previous studies (see, for example, Ferreira and Dionísio, 2014, 2016).

Table 1: DFA results for stock market returns.

Country	DFA exponent
Canada	0.5144 ± 0.0037
France	0.5134 ± 0.0040
Germany	0.5166 ± 0.0051
Italy	0.5308 ± 0.0049
Japan	0.5047 ± 0.0049
UK	0.4672 ± 0.0057
USA	0.4716 ± 0.0038

With the return rates, we calculated successively the correlation between r_t and r_{t-i}, from $i = 1,\ldots,200$. Firstly, we applied Pearson's correlation coefficient and we can conclude that linear correlations quickly turn non-significant in all countries, although in different lags[2]. However, our objective is to study the long-range

[2] Due to space constraints, we do not present every results but they would be available upon request. However, it is possible to say that for the USA and the German market the correlation is not significant immediately for the first lag, in Canada and Italy it is not significant in the third lag, Japan in the fourth, UK in the fifth and France in the sixth lag.

relationship of return rates. We calculated DCCA and the respective correlation coefficient between r_t and r_{t-i}.[3]

Figure 2 shows the behavior of the long-range correlation coefficient: the horizontal axis measures length boxes and on the vertical one the correlation coefficient. We chose some lags (from *t-1* to *t-200*) to show the results, comparing with lower and upper limits that allow the rejection of absence of correlation (with a 99% confidence level). If the correlation coefficient is outside the limits, then the correlation is statistically significant.

[3] The paper by Zebende et al. (2013) shows that this kind of analysis can be robust for simulated series, applying the ARFIMA process (long tail).

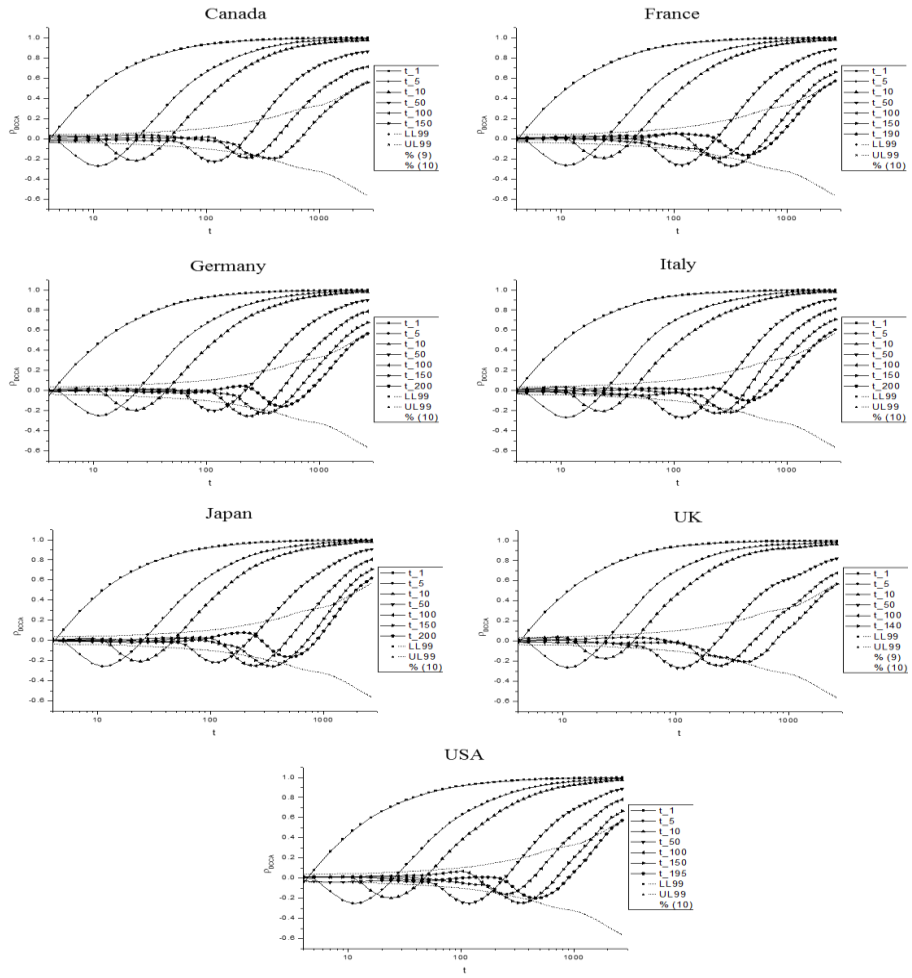

Figure 2: Detrended cross-correlation coefficients for the G7 return rates – t (days) is the time scale

Generically, all indexes have correlation coefficients that quickly become zero, for smaller boxes, the. However, for higher boxes, the correlation is highly significant. In first lags the correlation tends toward 1, meaning that, for shorter lags, there is evidence of strong long-range correlations. However, more distant is the lag, the lower is the correlation coefficient. This is an expected result, once is expected that return rates memory decay over time. Somehow surprisingly is the fact that the coefficient do not show evidence of quick decay, whatever the index we analyse.
The first index the reach the non-significant correlation, with a significance level of 1%, is the British one but just about at the 140th lag. It is followed by the Canadian index (150th lag), the French index (190th lag), the American index (195th lag), the German index (200th lag) and the Italian and Japanese indexes (both in the 210th lag). It means that some indexes have about ten months of memory in their return rates (we are working on a weekday base)[4].

Concluding Remarks

The verification or not of EMH is one of the most studied topics on finance. Recently, the advent of Econophysics increased the number of studies on this hypothesis, with the application of different methodologies that allow studying the long-range dependence of variables, even in the presence of non-stationary time series.

In this paper we propose to compare, between the G7 countries, which are those which have longer long-range dependence. With the implementation of DCCA and its correlation coefficient, robust methodologies to evaluate and analyse serial and nonlinear dependence, we find that all the seven indexes show evidence of (very) long dependence. The first index to reach the non-significance is the Canadian, while the Italian and the Japanese are those which have longer memory. Could we

[4] The mentioned study of Ferreira and Dionísio (2016) find that the memory of the USA stock market lasts for about 150 days. In this paper, the memory of that index goes to, approximately, 195 days. One possible explanation is the different sample of both studies.

conclude about (in) efficiency with those results? Probably no, first we should prove that this serial dependence promotes systematic and abnormal profits.

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