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MACROECONOMIC FUNDAMENTALS AND STOCK RETURN DYNAMICS: INTERNATIONAL EVIDENCE FROM THE GLOBAL FINANCE AREA

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Abstract

Through this paper, we seek to shed light on the divergence between expected and observed returns. Empirical theory attributes this divergence to macroeconomic fundamental shocks. We try, via an ECM model, to study the existence of cointegration relations between macroeconomic volatility and stock returns dynamics using monthly data over the period 1986 to 2008, for a sample of developed and emerging markets. Furthermore, we aim at quantifying the marginal explanation power of global risk-factors in the current sustained financial globalisation. Our findings show that local factors have an instantaneous effect on emerging markets but not very significantly on developed markets. However, global factors effect persists over the future periods on emerging markets but it is instantaneous and persistent on developed markets. Furthermore, local risk factors contribute increasingly to the explanation of the forecast error variance decomposition. Nevertheless, global factors contribute instantaneously but persist on future periods for the developed markets. Our findings may provide an additional contribution to the question of stock return dynamics as well as to the prediction of the 'Out-of-sample' stock return.

Keywords: stock return, macroeconomic volatility, local risk factors, global risk factors, ECM, impulse response functions, forecast error variance decomposition

JEL Classification: G12, G14, G15

1. Introduction

Capital market theory supposes that investors require an *ex ante* premium to hold risky assets. Since the *ex-ante* risk premium was not been easily observable; average past returns substitutes expected returns without considering uncertainties attributed to fluctuations of stock prices (Campello *et al.* 2008, 1297). Moreover, recent empirical investigations were interested in *ex post* mean-variance analysis without considering the statistical properties of stock returns and the problem of estimation risk.

For instance, Jorion (1985, 259) raised the question of *ex post* return versus *ex ante* return. Although estimation risk is a rational explanation (e.g. Elton 1999, 1199; Kumar *et al.* 2008, 1037), recent empirical investigation (e.g. Lettau *et al.* 2008, 1653; Boucher 2007, 1), shows that instability of stock returns through time is closely associated to macroeconomic volatility effects. Considering these questions, we aim at several purposes; (i) to clarify the relative influence of local and common macroeconomic factors on equity returns. (ii) To study stock market reactions to macroeconomic volatility and (iii) to study the relative contributions of the local and common factors. Our intentions seem to provide a basic tool to decision-making for international investors as well as for domestic governors.

The remainder of this paper is organized as follows: the second Section presents a review of empirical literature; the third Section presents the methodology and the empirical specification. The fourth Section, presents data and preliminary tests. In the fifth Section, we interpret and discuss our results to conclude some in the sixth Section.

FINANCIAL INTEGRATION IN THE FOUR BASINS: A QUANTITATIVE COMPARISON

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Abstract

The intention of the following paper is to present some stylized features of the financial integration of the four basin regions composed by the Baltic Sea, Black Sea, Caspian Sea and Mediterranean Sea regions. It discusses the developments, trends and features of the International Investment Position (IIP) in the regions. Using volume based indicators we compare and identify the gaps in them, whilst distinguishing between the EU e non-EU members and providing an overview of the asymmetries and the convergence as a result of the integration in the different financial markets. After reviewing the trends, the final chapter points to those areas that need further efforts to achieve greater regional integration.

Keywords: international financial integration, convergence, asymmetries, current account openness, FDI, financial development, portfolio investment

JEL Classification: F15, F21, F33

1. Introduction²

Starting from the 1990s, the European Union undertook a set of reforms addressed to complete the full liberalization of the capital transactions between the member states and the third parties. The purpose of the agreement was to accomplish the full financial integration of the European capital markets alongside the same principles of the common market for good and services³. In 2004, the Wider Europe and the European Neighbourhood Policy (ENP) projects proposed a '*comprehensive prudential regulatory framework for the financial services area*'⁴, aimed to reinforce the undergoing benefits of the capital account liberalization in the partner countries.

The original conceptual framework suggests, in combination with the achievement of the internal market and the implementation of the Economic and Monetary Union (EMU), that over time more financial integration will promote the stability of financial markets. Furthermore the new asset will enhance the overall economic performance with financial innovations and organizational improvements.

Moreover, the main benefit of the financial integration consists in the development of the financial sector, promoting deeper and more sophisticated domestic financial markets. Thus, banks and financial institutions may increase the financial alternatives for borrowers and investors⁵.

² This paper falls within EU4SEAS, *The EU and sub-regional multilateralism in Europe's four sea basins: Neighbourhood, Enlargement and Multilateral Cooperation*, research project funded by the European Union's Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no.225382 (visit www.eu4seas.eu for further information)

³ European Commission, *Capital Market Liberalization: The Single Market Review Series, Subseries III, Dismantling of Barriers*, (August 1996).

⁴ European Commission, *Communication from the Commission, European Neighbourhood Policy, Strategy Paper*. (2004), 15-16. "It will be key to the creation of business and the promotion of investments that these countries ensure that companies are able to operate on a level playing field. In combination with the above measures, access to European financial markets should, over time, add to the stability of partners' financial markets and help enhance their overall economic performance. The further liberalising of capital movements will provide new opportunities."

⁵ For a critical analysis of the benefits of capital liberalisation see Stiglitz, Josef E. 2004. Capital-market Liberalization, Globalization, and the IMF. *Oxford Review of Economic Policy*, Vol. 20, No. 1: 57, in particular the different impact between FDI and short-term capital flows.

THE LAW OF ONE PRICE: SURVEY OF A FAILURE

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Abstract

This paper aims to survey the literature about the Law of One Price in order to document its failure in terms of actual application. After a brief theoretical overview, which starts from classical economists' thought, the reported literature has been classified on the basis of three main streams: pricing-to-market (also considering investigations about differences between domestic and export prices), national borders, and tradability of goods. Reviewed works have been selected in order to provide a dedicated survey for 'the Law', which is absent in previous works about this topic. Therefore, the investigation has been kept intentionally separate from PPP-related debate.

Keywords: Law of one price, purchasing power parity, relative prices, exchange rate

JEL Classification: E30, F15, F31, F40, F41

1. Introduction

The Law of One Price (LoOP), is usually presented as the 'one good version' of the well-known concept of Purchasing Power Parity (PPP). Conceptually, LoOP implies PPP whilst the contrary is not true. PPP theory was first developed in XVI century at the University of Salamanca in Spain, and proposed in its contemporary fashion by Gustav Cassel (1918, 1922) between the two World Wars. This contribution was mainly founded on the debate about the restoration of the world financial system after the World War I, given that many countries which adopted the gold standard system before the war had to abandon gold convertibility of their currencies afterwards. Thus, the problem to evaluate correct exchange rates arose, as relative gold values could not be used anymore.

The basic idea behind PPP is that the nominal exchange rate between two currencies should be equal to the ratio of aggregate price indices between the two countries. In this way, PPP implies that a unit of currency of the first country would have the same purchasing power in terms of the second country's currency. This theory encountered enormous consensus. Parsley-Wei (1996) held that almost all of the theories for the determination of exchange rate and open-economy macroeconomic models use LoOP and PPP concepts. This opinion is widely accepted. For example, Dornbusch-Krugman (1976) wrote: 'under the skin of any international economist lies a deep-seated belief in some variant of PPP'; Rogoff (1996) said: 'most [economists] instinctively believe in some variant of PPP as an anchor for long-run real exchange rates', and explained that, today, PPP has a key role in relevant macroeconomic matters such as, for example, fixing the correct exchange rate for a newly-created currency, or forecasting medium and long-term exchange rate movements, or analysing the price differential in income comparisons among countries.

In its purest version, the Law on One Price states that the same good must have the same price wherever it is sold, including in different countries, once its price is expressed in terms of the same currency. In the event of different prices for the same good, arbitrage would immediately operate: agents would buy it where the price is lower in order to resell it where the price is higher, until the difference disappears. The presence of transportation costs implies a more general condition for LoOP to work: whether transportation is possible, the price paid for a good can differ among places.

In sight of a dedicated survey for 'the Law', which is absent in previous works about this topic, this paper will try to document that LoOP does not survive the move from theory to practice. This result will be shown through a review of the relevant literature, trying to show how LoOP is depicted as a failure in many studies.

The main difficulty was to isolate contributions that effectively have impact on the LoOP debate. Many streams of literature have seen the light since the first papers in the 1970s, as explained in Goldberg-Knetter (1997): many of them deal with LoOP indirectly, referring to market power of firms, to PPP, or to other aspects.

The review will be presented avoiding literature focused on the dynamics of exchange rate as a mean to reach LoOP, within PPP debate. However, also PPP is generically rejected in dedicated studies, at least in the short-run; most of the times, this rejection is based exactly upon the failure of the LoOP, as it is explained for example in Engel (1993), Rogers-Jenkins (1995), and Engel-Rogers (1995).

THE YIELD CURVE AND THE PREDICTION ON THE BUSINESS CYCLE: A VAR ANALYSIS FOR THE EUROPEAN UNION

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Abstract

The literature on the yield curve deals with the capacity to predict the future inflation and the future real growth from the term structure of the interest rates. The aim of the paper is to verify this predictive power of the yield curve for the European Union at 16 countries in the 1995-2008 years. With this regard we propose two VAR models. The former is derived from the standard approach. The later is an extended version considering explicitly the macroeconomic effects of the risk premium. We propose the estimates of the models and their out-of-sample forecasts through both the European Union GDP (Gross Domestic Product) quarterly series and the European Union IPI (Industrial Production Index) monthly series. We show that our extended model performs better than the standard model and that the out-of-sample forecasts of the IPI monthly series are better than ones of the GDP quarterly series. Moreover the out-of-sample exercises seems us very useful because they show the jump out arising from Lehman Brother's unexpected crash and the becoming next fine tuning process.

Keywords: yield curve, monetary policy, business cycle, risk premium, real growth

JEL Classification: E43, E44, E47, E52

1. Introduction

In this paper we investigate on the yield curve and on its predictive power for the Euro Area (fixed at 16 countries) in the 1995-2008 years. In order to forecast the future growth of the real activities for the European Union we consider two VAR models. The former is the standard model where the yield spread is only used to forecast the output growth. Next, we present a more extensive model consistently with the macroeconomic and the financial theory; it is represented by six risk adjusted equations in order to include the impact of the market risk premium on the economic system. We use the VAR estimations to propose the out-of-sample forecasts both for Gross Domestic Product, GDP, (on quarterly frequency) and for Industrial Production Index, IPI, (on monthly frequency) annual growth rates of the European Union. We use also the monthly IPI series because we seem us embedding better the volatility of the changes of the interest rates. This last exercise seems us very useful because it allows us to show and to analyse the jump out on the predictive power of the yield curve following the explosion of the bubble at the unexpected Lemman Brother's crash and the expectations' next fine tuning. The data source is coming from the statistics of the European Central Bank.

The paper is organised as follows. Besides this introduction, in Section 2 we discuss about the economics of the yield curve, while in the Section 3 we investigate graphically about the basics of the yield curve of the European Union in the involved years. In the Section 4 we present the methodology and the data of the empirical analysis. The Section 5 is devoted to show the results of the VAR empirical analysis according to typical approach, while in the Section 6 the results of the both VAR's estimations and forecasts are illustrated. Finally there are some conclusive remarks and the appendix.

2. The economics of the yield curve

The literature on the yield curve is very extensive and we are not able to discuss it exhaustively. The first papers investigating the relationship between the term structure of the interest rates and the inflation and output growth go back in the 1980s. These analyses found that the yield curve contains more information than stock returns in order to predict both the future inflation and the future growth of the real activities. On the one side, Harvey (Harvey 1988,1989) introduced the methodology showing as the term structure spread can predict the GDP growth accurately; on the other side, Mishkin's model derived from the Fisher condition (Mishkin 1990,1991) found that through the yield curve it's possible forecast the future inflation. These results have been confirmed and extended by a lot of next papers. All of these studies dealing with the predictability of the yield

NEUROECONOMICS AND DECISION MAKING PROCESS

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Abstract

Neuroeconomics unified the once disparate fields of economics and psychology. The central thesis of the paper is that the development of behavioral economics in important respects parallels the development of cognitive science – Neuroeconomics has inspired more change within economics than within psychology because the most important findings in Neuroeconomics have posed more of a challenge to the standard economic perspective. The single most important source of inspiration for behavioral economists has been behavioral decision research, which can, in turn, be seen as an integration of ideas from cognitive science and economics. Neuroeconomics has primarily challenged the standard economic assumption that decision making is a unitary process – a simple matter of integrated and coherent utility maximization – suggesting instead that it is driven by the interaction between automatic and controlled processes. This paper reviews neuroeconomic research in areas of interest to both economists and psychologists: decision making under risk and uncertainty, intertemporal choice, and social decision making.

Keywords: neuroeconomics, behavioural economics, affect, behavioral welfare economics, decision making, caeteris paribus

JEL Classification: A12, D81

1. Introduction

In the last decades has been made Considerable progress, and increasingly, economists are taking up the challenge of attaching economic theory to psychological foundations. In the 1970s cognitive psychologists began studying judgment and economic decision making. They took maximization of utilities and logical rules of probability judgment as benchmarks and used conformity or deviation from these benchmarks as a way to theorize about cognitive mechanisms (much as optical illusions are used to understand perception). Important psychology of this sort was done Ward Edwards in the 1950s, and later by Amos Tversky, Daniel Kahneman, Baruch Fischhoff, Paul Slovic, and others. As more economists come to accept and incorporate findings from behavioral economics, the approach is likely to become such an integral part of the toolkit of economic analysis that we will no longer speak of a distinct 'behavioral economics.'

In its relatively short lifetime behavioral economists has influenced a wide range of subtopics of economics and allied fields, such as *behavioral law and economics* (Jolls, Sunstein, and Thaler 1998; Sunstein 2000) to *behavioral finance* (Shleifer, 2000; Bică and Constantinescu 2007), *behavioral development economics* (Mullainathan, and Thaler 2000), *behavioral public finance* (McCaffery, and Slemrod 2006), *behavioral game theory* (Camerer (2003), and *behavioral macroeconomics* (Akerlof 2003). All of these are booming areas of research that not only extend the influence of the ideas coming out of behavioral economics, but also throw back insights and findings that enrich the foundation of the basic science core of the field.

Evaluating economic behavior without taking account of the findings of psychology is like dealing with quantitative relationships without using readily available techniques of mathematics. Nonetheless, since the beginning of the twentieth century, mainstream economics has done just that, limiting itself to the assumption of optimization or to others of an ad hoc basis that have struck individual economists as plausible for the time and circumstances. But investors often continue to hold onto stocks that have declined in value and have poorer prospects than before, compared to others.

In traditional economic thought, the analysis focuses on how to allocate resources efficiently. That is supposed to maximize welfare for consumers (or the potential of that), enabling consumers to do the best that is possible. Behavioral economics indicates that there are serious limits to that theory insofar as it describes how humans actually behave. Behavioral economics focuses more modestly on how to move economic behavior away from manifestly poor choices towards better ones – without venturing whether the result comes particularly close to any standard of optimization, which it contends, often is simply not ascertainable, in any event. It is concerned not only with what takes place when supply and demand are neatly in balance, but when, as is so often the case, market forces are in disequilibrium, as is common aftershocks to the system such as natural

THE EVOLUTIONARY DYNAMICS OF TOLERANCE*

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Abstract

This paper incorporates the phenomenon of tolerance into an economic analysis, showing how different attitudes to trust and cooperation can affect economic outcomes. In the economic system we propose, tolerance is associated with the different weight that agents attribute to their own nature and to the institutional parameters in their utility function. We thus construct an overlapping generations model (OLG), showing that the incentives that influence descendants' predisposition to tolerance depend on both institutional factors, where behaviour is imposed by rules, and on social (or cultural) factors, found in popular customs and established traditions. Our study highlights the absolute impossibility of affirming tolerance through formal rules. In fact, we show that intolerance emerges as persistent attitude (intolerance trap) and its control is only possible through constant and continuous interventions on the educational processes of new generations.

Keywords: tolerance, overlapping generation model

JEL Classification: D1, Z1

1. Introduction

This paper shows that the phenomenon of tolerance, defined as a generic ability to accept diversity, can easily be integrated into an economic model, providing a new explanation for a number of both economic and social phenomena. The economic literature on this subject is fairly recent; intolerant behaviour inevitably affects several important factors of economic growth and social development, such as trust between economic agents, cooperation, the free movement of ideas and talent and at the same time promoting corruption and rewarding group membership rather than merit (Tabellini 2010).

The theory developed in this article is the natural continuation of Iannaccone's (1997) economic study on fundamentalism that recently culminated in Arce-Sandler's (2003-2008) and Epstein-Gang's (2007) theoretical models and in Corneo-Jeanne's (2009) preliminary and pioneering study on the economic theory of tolerance.

In this paper, we adopt a model to analyse the evolution and persistence of social attitudes towards tolerance through the dynamic properties of a precise mechanism of cultural transmission and socialization.

More specifically, tolerance is incorporated in an OLG model, showing that this has a remarkable impact on the economic equilibrium of the system. In our model, the cultural values of tolerance are transmitted through the educational efforts exerted by parents on their children. However, the incentives that influence the descendants' predisposition to tolerance depend on both institutional factors, where behaviours are imposed by rules, and on social (or cultural) factors, found in popular customs and established traditions. The tolerant individual reaches a compromise between the different influences by minimizing the friction between her own and social choices. In this choice, economic-type evaluations will prevail.

Our model assumes that there are two social categories, 'tolerant' and 'intolerant', identified on the basis of their different behavioural characteristics, or rather, by a different representation of own preferences. Each

* We are grateful for constructive comments to seminar participants at various universities where a previous version of this work were presented. We have profited from helpful comments by Barbara Annicchiarico and Guido Cozzi on an earlier draft. The authors alone are responsible for the views expressed in the paper and for any errors which may remain.

DIFFERENTIAL GAMES IN NON-RENEWABLE RESOURCES EXTRACTION

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Abstract

Traditional economic theory, up to the middle of the twentieth century, builds up the production functions regardless the inputs' scarcity. In the last few decades has been clear that both the inputs are depletable quantities and a lot of constraints are imposed in their usage in order to ensure economic sustainability. Furthermore, the management of exploitation and use of natural resources (either exhaustible or renewable) has been discussed by analysing dynamic models applying methods of Optimal Control Theory. This theory provides solutions that are concerned with a single decision maker who can control the model dynamics facing a certain performance index to be optimized.

In fact, market structures or exploitation patterns are often oligopolistic, i.e. there are several decision makers whose policies influence each other. So, game theoretical approaches are introduced into the discussion. According to the theory of continuous time models of Optimal Control, the appropriate analogue of differential games is used. Roughly, this is the extension of Optimal Control, when there is exactly one decision maker, to the case of N ($N \geq 2$) decision makers interacting with each other.

Keywords: non-renewable resources, dynamic interaction, economic regulation, differential games

JEL Classification: C61, C62, Q32

1. Introduction

In the literature of environmental economics, existing models often make an assumption in which the involved agents exploit the resource from a common pool area in a non-cooperative way. This approach yields inefficiency in the well-known sense 'tragedy of commons' (Benchekroun 2003). Tragedy of commons refers to a situation in which a producible asset is exploited jointly by several economic agents whose 'noncooperative' behavior results in overexploitation of the asset, i.e., an exploitation of the asset that is not jointly efficient (Pareto optimal).

In fact, market structures of exploitation patterns are often oligopolistic, i.e., there are several decision makers whose policies influence each other. So, game theoretical approaches are introduced into the discussion. According to the theory of continuous time models of Optimal Control, the appropriate analogue of differential games is used. Roughly, this is an extension of Optimal Control, when there is an exactly one decision maker, to the case of N ($N > 1$) decision makers interacting with each other.

Dynamic models of exploitation (or harvesting) and use of natural resources refer to two different systems of property rights: In the case of sole ownership, optimal extraction policies can be obtained by means of Optimal Control Theory (Clark 1976); in the case of open access or common property exploitation, game theoretical models are applicable in the sense that all decision makers exploit a resource from a common pool without any restriction, looking only at their own profits over some time horizon, and without considering the stock of the resource, which is diminished due to the extraction policies of all the players of the game who share the common pool (Clark 1980, Dockner *et al.* 1989).

Environmental problems can be understood as the exploitation of a common pool of a natural resource by several players. For example, activities with polluting results have cumulative future consequences. Activities of some nations may affect the interests of other nations, that is a kind of players' interdependence. The emissions of sulphur lead to acid rain, which does not respect borders, or pollution of the sea caused by industrial activities

CONSUMPTION IN DEVELOPED AND EMERGING ECONOMIES

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Abstract:

In what follows various econometric technique is applied to determine the source of consumption growth with historical retrospective to equity and real estate markets as well comparative analysis of US consumer and Chinese consumer is presented. Evidence supports the argument that consumption as economic growth engine has been possible only due to ability to withdraw and spend equity from appreciating assets in the USA. Financial underdevelopment of emerging economies makes replication of this process questionable.

Keywords: consumption, household wealth, consumer credit, credit

JEL Classification: E21

1. Introduction

Consumption is important driver of growth in terms of conventional GDP accounting, therefore determination of the source of consumption financing in developed countries might shed light on how likely is emerging market consumer to become the new engine of economic growth. First, source of increased US consumption during 1995-2005 is determined. Legislative amendments allow identifying possible benchmark years for structural change. Analogue of Chow test via dummies reconfirms structural changes in the economy in 1995 as well as 2000. Due to appreciating asset prices from deregulation of real estate and commercial banking industries, consumption no longer relies on disposable income but rather consumer wealth that translates into stationary between consumer credit and consumer wealth. Consequently, economic growth dependent on consumption is actually economic growth dependent on appreciating assets⁵⁴ rather than, say, technological progress. As a result, ability of emerging markets to become new engine of growth requires ability of households to benefit from appreciating equity markets as well as real estate markets. It is shown that these necessary conditions are not present in China as emerging market proxy. Therefore, argument in favor of the superiority of emerging markets in setting global economic growth is questionable.

2. Developed market perspective

Equity boom in the US that started in mid 1990s has been driving consumer wealth (CW⁵⁵) and consumer credit (CC⁵⁶) with it up to the early 2000 when deregulation in the financial sector coupled with development of sophisticated financial products allowed to securitize illiquid assets, increasing wealth of consumer via raise in the price of previously illiquid assets like real estate (Figure 1). Laibson, Mollerstrom (2010) have argued that asset price movements, including the equity markets and residential real estate markets are capable of explaining international financial flows (i.e. private debt build-up). During the period of inflated asset values, US consumers spent their new wealth, with marginal propensity to consume of about 4%. The asset bubble framework also quantitatively explains the large current account deficit of the US.

⁵⁴ This is interesting phenomenon when conventional CPI figures do not capture asset price inflation, i.e. CPI in the USA in 1990 – 2005 remained flat. Or rather, this might simply means that CPI is not useful tool in analysing economic situation.

⁵⁵ From the Federal Reserve's B.100 Flow of Funds release.

⁵⁶ The total outstanding consumer credit amount. This index is taken from the G.19 report disseminated by the Federal Reserve. Covers most short and intermediate term credit extended to individuals, excluding loans secured by real estate.

INTELLIGENT AGENT APPROACH FOR BUSINESS PROCESS MANAGEMENT

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Abstract

In recent years businesses around the world have been facing the challenges of a rapidly changing environment due to the development of business market and technology. As a result, organizations are paying more attentions to supporting business process management with the ability to adapt to the dynamic environment.

Furthermore, business climate is changing from centralized and closed to distributed and open mainly by virtue of the proliferation of networks.

Therefore, an agent-based approach is proposed in this research to manage complex business activities. In this approach, business activities are delegated to a number of autonomous agents. These agents may be human beings as well as machines or software applications. Each of them has awareness of situation and can make real-time decisions on activities.

Keywords: business process management, real-time decisions, workflow

JEL Classification: D81, L21, O32, M1

1. Introduction

Management of business process in an organizational setting is commonly referred to the development of business applications that directly follow the execution logic of the underlying business processes. However, traditional workflow approaches model and manage business process based on a predefined logical procedure of activities and from a centralized perspective.

That is, a complete list of all the activities and all the paths are provided, the criteria for following a particular path are specified, and the ordering constraints on the actions are given.

The intelligent agents are strictly linked to the existence of informational and communicational technologies, especially the Internet; outlined as a type of specialized activity, autonomous, very useful for an important part of business. According to the specialists' opinion the intelligent agents represent a new type of logicians, specialized in Franklin, and Graesser (1996), and Wooldridge, and Jennings (1999).

Researching, extracting and treat information automatically for the user in an informational network or in a database is a new way to approach a business process. An agent is a computational system located in an execution environment, capable of autonomous action in that environment in order to achieve the planned objectives (So, and Sonenberg 2004).

Unlike the classical interface ways with the computer, the intelligent agent is autonomous and much more active, representing a hardware or software system which has a series of properties (see Table 1). In Table 1, we are presenting the main characteristics that we also find in Franklin, and Graesser (1996).

Table1. Main characteristics of intelligent agents

Characteristics	Description
Autonomy	Operates without human intervention and has control on its own actions. The agent accepts requests of user but it is the one that decides how and where these requests will be satisfied.
Initiative	Collaborates with the user or with other agents to satisfy their requests, being able to propose modifications or ask for further clarifications.



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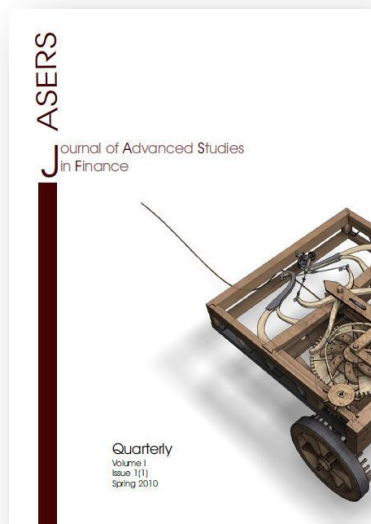
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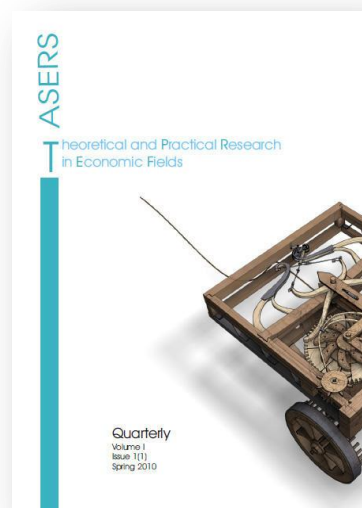
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