Financial systems and markets

THE OBJECTIVITY OF INTEGRATING THE REGULATION AND SUPERVISION OF FINANCIAL MARKETS AND THE POSSIBILITIES OF ITS PRACTICAL IMPLEMENTATION[1]

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Abstract

The development of financial markets is to an increasing extent currently characterized by their interior and exterior integration, internationalization, evolution of a number of new highly sophisticated financial instruments, especially in the segment of financial derivatives, increasing securitization and creation of very complex international financial structures and financial flows within their framework. At the same time the necessity of restoring free market competition, growing volatility of monetary and financial quantities, institutionalization and intellectualization is more and more intensively discussed. Understandably, both regulation and supervision of the markets have to adapt to these objectively existing trends, including the growing call for increasing the efficiency of all activities. The integration of relations and processes carried out in financial markets requires a similar integration of relations and processes in the sphere of their regulation and supervision. However, there are a number of features of "lower level objectivity" or specific subjectivity and other characteristics functioning in this sphere which modify the implementation of the above mentioned trend, both in terms of depth and width of its intention and especially in terms of its concrete shape. The level of accepted specifics should never impair the very substance of the integration trend. That is the problem dealt with in the presented contribution.

Keywords: *Financial markets; Integration tendency; Regulation and supervision; Specifics of integration of regulation and supervision*

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1. Introduction

Recent research in the field of regulation and supervision of the financial market is aimed at finding and defining theoretical and methodological bases for analysing existing systems and basic relations between the development stage of this market and corresponding system of regulation and supervision, so as to ensure the optimum and efficient range of these activities while respecting acceptable costs, and lastly to define quality and quantity criteria for efficient operating of the systems of regulation and supervision of the financial market, and to define theoretically the optimum organizational structure of the systems using the above mentioned criteria.

It is necessary for the effort and the possibility of their realization to be based and consequently elaborated respecting deep and valid knowledge of objectively working trends, which objectively define the content and scale of relations and processes, subjects and objects which should exist and work in this sphere, but also their form and ways of their realisation and selfrealisation. It is essential, in accordance with these efforts, chosen starting points and model forms of relations, processes, subjects and objects created on their base, to compare their identity with or differences from the forms of their real, practical and mainly subjective application. The possibility of such comparison and the level of its application is of course directly connected with the level of the knowledge of reality, with the feasibility of settled objectives and last but not least with the possibility of suggesting changes within the existing form and, in case of consensus with their principle and form, of their subsequent realization. Regarding the enormous complexity, relevance and expensiveness of everything hapenning in the mentioned sphere it is very difficult to come to such consensus and therefore it is essential to pursue with maximum prudence and coordination all partial steps which must unconditionally be taken to achieve more complex solutions. Activities such as the “Big Bang” are possible only exceptionally and such operations are mostly both factually difficult and time demanding. The factual, in complex meaning, and time demands are significantly increasing at present and characterised by globalization, internationalization, integration, intellectualization, institutionalization and who knows what else. Existing dimensions are becoming almost automatically totally different, and misunderstanding or even neglect of the fact is, in my opinion, unacceptable and could result in serious problems.

Another partial issue, though in my opinion a very relevant one, to be solved today within the studied area is the issue, or better to say the problem

of integration of the regulation and supervision of the financial market, maybe better to say markets. Objective changes in market economies unconditionally necessitate corresponding changes in the system of regulation and supervision of financial markets. Such changes have already been implemented in a lot of countries with more advanced financial markets than those in the Czech Republic, and here I mean especially EU member countries. In our country such changes are in preparation. It is impossible not to point out that it is the preparation, namely a significant change of its course and results which took place a few weeks ago, that made me accelerate the elaboration of my views on it. I am convinced that it is not positive change, but on the contrary that there are a lot of risks which can have negative impacts. The effort to avoid them or at least to explain them is thus one of basic reasons why I have prepared this contribution.

2. Systems of regulation and supervision and efforts of their optimization

The contribution dealing with the issue of integration of the regulation and supervision of financial markets cannot be complete without at least a very brief remark[2] concerning its systems, their classification, main types and the effort to optimize them and thus ensure the most efficient meeting of their basic objectives and tasks.

The existing development of the regulation and supervision is connected with a vast set of specific systems, proving a lot of differences and diversities. The differences reflect the functioning of a lot factors, e.g. different historical development in individual countries, different structures of financial systems, different political systems and their traditions and last but not least the size of areas of individual countries and that of their financial sectors. Besides the above mentioned differences, different systems have as well a lot of identical and general characteristics, e.g. the basic objective of regulation and supervision, which can be understood as the preservation of the integrity of the financial market, namely the protection of investors, in its concrete forms, together with retaining its maximum functionality and efficiency.

However, the individual systems differ in many specific items, especially in what they regulate, whether they regulate subjects acting in certain subsegments of the financial market, or the subjects activities in the same or different subsegments, what is the extent and depth of the regulation and

[2] V. Pavlát, A. Kubíček: Regulation and Supervision of Cupital Markets, pp. 12 - 40

supervision, whether the regulation and supervision are executed by one or more subjects, what are the powers of this subject or subjects, etc. Some of the mentioned items are of qualitative character, others of quantitative one, and it is also possible to encounter their combination.

2.1 Classification of the systems of regulation and supervision

The systems of regulation and supervision are partly based on legal standards approved by legislative bodies according to a proposal of an authorized subject (sometimes we meet such terms as the top regulator or the regulator of higher grade) and brought to perfection in implementing provisions issued by the regulatory body (usually called the regulator), and partly on the ways and forms of controlling activities (control, monitoring, supervision) carried out by supervision bodies, which can either make part of the regulator or be independent. Numerous classifications have been created for an easier orientation in individual systems according to specific items which constitute these systems. As an example I would like to give a classification used in the above mentioned publication.[3]

1. The subject of regulation – institutional or functional systems
2. The extent of regulation – universal (general, all-embracing, or so-called mega-systems) or specialized systems
3. The number of regulators of the financial sphere – systems with one or several regulators
4. The position of the regulator in the system of state institutions - centralized or decentralized systems, or a combination of both
5. The powers of the regulator – autonomous or subordinate systems
6. The democratic nature of the regulator's functioning – systems of the state regulation and supervision or systems with the elements of self-regulation of the regulated organizations or their craft associations
7. The way the regulator's activity is financed – either systems fully financed by the means of the regulated organisations or the systems fully financed by the means of the
8. national budget, or systems financed in a combined way
9. The way the regulation and supervision are exercised by the regulator – systems which use more formal and bureaucratic approach to solve the problems of regulation and supervision, or systems which lay the primary emphasis on the content (factual) side of a problem.

The above mentioned characteristics, which are intentionally given here as contradictions, however, do not occur in their absolute form in practice.

[3] V. Pavlát, A. Kubíček: The Regulation and Supervision of Capital Markets, p. 13

Every concrete system of regulation and supervision is mostly a combination of individual elements while the importance of some of them is predominant. It is necessary and very difficult at the same time, while creating this real "mixture", to keep a proper rate of combination, and that of compatible elements only. Although a generally acceptable optimal model is in practice almost unreachable, there is a theoretical possibility to create it by a combination of compatible elements. As an example we might possibly mention an autonomous functional system containing the elements of self-regulation, financed by the means of regulated subjects, which is factual, transparent and flexible, and it is necessary to add: relatively inexpensive and efficient. And it is, of course, possible to formulate quite easily an idea of the opposite to the optimal system defined that way. The created classification is an essential basis for a practical comparison of real systems existing in individual national economies, as well as for the creation of models of their further possible development. Similarly it creates the basis for the typology of these real systems and their possible future forms.

2.2 Current main types of regulation and supervision of the financial market

There are three main types of the regulation and supervision of financial markets in the contemporary world:

a. **A mega-system**, in which the only one universal regulator of the whole financial sphere ensures the regulation and supervision of the whole financial administration realized in a given national economy. I am going to deal with this type in greater detail in the following part of my contribution because I consider it to be generally the most progressive;
b. a system based on the existence of a **pair of regulators**, each of them being in charge of administration related to the regulation and supervision of the financial market;
c. a system of regulation and supervision which is carried out by **one or more specialized regulators.**

As an example of the first type it is possible to mention the systems introduced quite recently in Great Britain, the Federal Republic Germany and Austria, which in my opinion represent one of the best possible forms

of a reaction to the trends in the development of financial markets; the second type, which is also called "a twin", is currently used in Australia, and the third one exists for example in Italy, where the regulation and supervision of the capital market as a segment of the financial market is vested in one specialized institution, other segments being regulated by one or more specialized regulatory institutions.

Before any further deeper analysis of the mega-system it is necessary to say already here that it is usually internally differentiated. However, within this all-embracing system there are usually parts which fulfil the functions previously performed by independent regulatory subjects, and focused on the regulation and supervision of a certain group of institutions – banks, insurance companies, subjects of collective investing, securities dealers, etc., in an institutional system, or to certain sets of activities – securities dealing, collective investing, supplementary pension insurance, etc., in a functional system of regulation and supervision.

In the patterns used until now, the main types of systems of regulation were divided in such a way to see clearly the prevailing trend of development leading to uniting separate systems of regulation and supervision of individual segments of the financial market into a sole, universal and all-embracing entity – a mega-system or, in other words, **an integrated homogenous system.** However, this point of view is not only a view expressing an intention of the author, it is in the first place the necessity to emphasize the objectivity of the relationship between the development trends of the regulation and supervision, and the elementary development trend of the current financial market as a complex, internally differentiated system which moreover –with growing internationalization and globalization – will in future undoubtedly head for even more complex forms and ways of integration of the regulation and supervision of financial markets.

2.3 Optimization of regulation and supervision of financial markets and its possible methods

In any period of the current as well as the future development of the financial market, the views on the level and range of regulation differ considerably. The only thing they have in common is that the regulation has never been optimal. According to the views you may encounter on the level of individual subjects of the financial market, it is usually too severe and costly, not efficient enough, even unnecessary, etc. Under certain conditions

of the financial market situation, such assessment and the like can be agreed upon even by those subjects that under different conditions have different views resulting from their different interests. Such situation is usually called overregulation, which is mostly a considerable simplification. Under different conditions that can be associated, in a simplified way, with another stage of the business cycle and its usual excesses aimed at maintaining the so far achieved profit rate, the same subjects can consider the regulation too low, toothless, rigid, unable to predict future development, etc. but again too expensive and not efficient enough. This state is usually called, in a very simplified way, under regulation. Besides those two extremes there is also a third state, in my opinion more frequent, in which the views on regulation and supervision differ according to the interests of individual groups of subjects operating on financial markets represented by investors on the one hand and financial services provided.

The above mentioned facts and a whole range of other opinions result, both in theory and practice, in a permanent effort to optimize the regulation. Generally, it can be stated that this effort is carried out mostly in two levels, first in understanding the substance of optimization and its defining and consequently in realization of the defined. In any case, the third level of this effort, the level of permanent improvement of the result achieved in the previous two levels, cannot be neglected.

As far as the understanding or definition of an optimum system of regulation and supervision of the financial market is concerned, this issue was mentioned, though very briefly, in subchapter ***2.1***, so now I am going to be more specific about the above mentioned and to show some possible ways how to achieve the required.

First, let us raise the question what is "required" of financial markets regulation and supervision. Because I neither can nor want to deal with all the pleiad of possible answers and their analysis and assessment now, I will help myself out of it by something more or less agreed upon by the majority of theorists and practitioners, by an example of the definition of the role and objectives of the Securities Commission in Article 2 Section 2 of the Act no.15/1998 of the Collection of Laws, as amended: "The role of the Commission is to strengthen investors' and issuers' confidence in the capital market. The objective of the Commission is to contribute to the protection of investors and the development of the capital market and to support education in this area." We may encounter similar definitions, some brief, others florid, not only in legislation but also in numerous publications of various nature published almost anywhere in the world in the past, at present and, undoubtedly, in the future, too. At the International Conference on

Regulation and Supervision, organized by VSFS in 2003, I defined the basic objective of the regulation and supervision as follows: "maintenance and further development of a fully functioning financial market, namely in all its particular forms and shapes, to enable it to fulfill its basic purpose . . . "[4] At the same time, it is necessary to emphasize that besides these basic, general, irrefutable, strategic objectives it is always necessary to define also the objectives and tasks concerning the changes in the financial system which took place in the past or are showing in outline as probable trends of development. In a modern dynamically developing economy, regulation and supervision must not lag behind the dynamism of financial markets development bringing new problems all the time, whose positive solution - in favour of investors - the existing regulation and supervision should contribute to.

If we consider an optimum system of regulation and supervision, then these considerations must unambiguously result in the premise of its **maximum flexibility**, which would not only secure a fast reaction to current problems by means of repressive measures (negative regulation) but also anticipate potential negative situations and apply the complex of its preventive measures in advance (positive regulation). Unfortunately, most of the currently used systems of regulation and supervision meet the prerequisite of flexibility and combination of suppression and prevention only partially.

When solving the optimization of the system of regulation and supervision, it is impossible to avoid the problem of efficiency of the institutions running the system. The efficiency of the whole system cannot depend on an optimum combination of its compatible elements only. As far as the costs are concerned, changes in the system are mostly connected with relatively high, but more or less nonrecurring costs, whereas the operation of executive bodies of regulation and supervision claims permanent supply of financial means. From this point of view, it is very important to define a set of materialized quantitative as well as qualitative indicators of results (positive or even negative) achieved by these bodies and compare them with the costs incurred. The procession of such a set of indicators is unfortunately still nascent and any complex agreement does not seem impending. There are still such extreme views as "the most effective regulation is no regulation at all". The elaboration of these issues will be the objective of our research team in the near future.

[4] In: Regulation and supervision of financial markets. Proceedings of International Konference, VSFS, Prague, June 24 – 25, 2003, p. 28

3. Basic trends of the future development of financial markets and system of their regulation and supervision

I have already mentioned some basic trends of the future development of financial markets, such as internationalisation, globalisation, integration, intellectualisation, etc. Now, I would like to deal with two concrete forms of applying those trends, and than also with the reflection of those changes in required and partly also accomplished modifications of the system of regulation and supervision.

3.1. Financial conglomerates

The establishment of conglomerates, i.e. simply said economic subjects formed by joining units of various fields in the only one large complex, has been a momentous manifestation of trends in the economy since the last century. This phenomenon is quite new in the financial sphere mostly because the possibilities of free movement among individual segments of the financial market, at national and international scale, were until recently relatively considerably restricted due to the elements built in the existing regulatory systems. We can mention, for example, the strict separation, in force until recently in many countries, of commercial banking from securities dealing, as well as the separation of insurance activities from other fields of financial dealing. The gradual development of conglomerates, even in the financial sphere, could have occurred only at the moment of weakening of the field principle of regulation, and more generally at the moment when, as an important part of objective trends gaining ground in the field of financial market regulation, the principles of deregulation and harmonization were recognised by political will and projected into the relevant legal norms. It is also important to mention, and I will deal with this issue in greater detail in the following chapter, that this step has not been until now and cannot be very penetrative, and it is just because not everything is clear and solved down to the last detail and we do not wish for any unpleasant surprise.

Financial conglomerates are usually defined as: ‘a group of companies under common control whose exclusive or prevailing activities are based on services provision in at least two financial sectors (i.e. banking, securities, and insurance)[5]

[5] The supervision of financial conglomerates. A report by the Tripartite Group of Banks, Securities and Insurance Regulators, July 1995, p. 13

There are not only financial conglomerates but also mixed conglomerates in the financial sphere which are mainly focused on trading or other industrial activities, but at least one regulated financial unit functioning within the framework of their overall structure must be included.

We may distinguish five types of financial conglomerates according to the form of their internal structure:

1. groups in which individual companies mutually own significant stakes in other companies within the given group
2. groups which are headed by a licensed holding group superior to other companies which are members of the group
3. groups which are headed by a non-licensed holding group superior to other members of the group
4. groups with highly integrated companies
5. groups with a different structure

The above mentioned types are, on the basis of their historical development, more or less connected with the individual national economies and, on top of that, they are regulated by legal regulations which are far from being fully compatible mostly because this is a new and not quite known issue, and various political and professional groups perceive it differently and their worries are different too. That is why these financial conglomerates regulated it with different intensity and by means of different instruments.

3.2 Financial derivatives

By financial derivatives we mean, for example for the purpose of our law of capital market dealings:

a) options and investment instruments stipulated by this law,
b) financial forward contracts (namely futures, forwards and swaps) concerning investment instruments stipulated by this law,
c) difference contracts and similar instruments for the transfer of interest rate or exchange rate risks,
d) instruments enabling transfer of credit risks,
e) other instruments which result in the right to financial compensation, and the value of which is derived primarily from the investment securities rate, index, interest rate, exchange rate or the commodity price[6].

[6] Article 33 Section 3 of the Act no. 256/2004 of the Collection of Laws, dealing with business activities in capital markets

In addition to the above mentioned financial derivatives there exist a lot of others which our legislative has not accepted and our practice has not managed to term yet. They represent the most dynamically developing and at the same time, from the viewpoint of the possibility of their rational and effective regulation and supervision, also the most problematic objects of the financial market. A few weeks ago, not only me but also the members of the International Conference about the Situation on Financial Markets could listen to the opinion of one of our most erudite specialists saying that these investment instruments and insufficient regulation of trade (or maybe better quasi-trade) represent a significant threat not only for the development but even for the existence of national financial markets (an organized market with these instruments in the Czech Republic has not, luckily, come into existence yet), but also for international financial markets and not only for them. One of the most important regulation principles, in my opinion, was breached on derivatives markets, namely the ability to enter the market was offered only to such investment instruments which are by their nature transparent, clear and controllable and such is also their trading, including their content and aims.

The popularity of financial derivatives originates in the possibility to use them in two ways: on the one hand they successfully hedge securities dealings against possible risks and, on the other hand they are suitable for speculations. While the first way results in the risk reduction, which is an important factor of investor protection, the second way is connected with substantial risk increase, i.e. threat to investors, which could, together with a considerable institutionalisation growth in this segment, have fatal consequences.

Taking into consideration what has been said and the fact that not only the volume of derivatives trading but also the volatility on capital markets have considerably increased, it is quite understandable that the regulators have paid, in the last few years, a great attention to the speculative use of derivatives. Their effort – to elaborate and further develop methods of regulation and supervision of the activities of financial market institutions which deal with derivatives – is hampered by their unfinished integration at national as well as international
levels, while integration and globalisation of derivatives trading is already in a more advanced stage. Since the mid 90s of the last century, it has particularly been the Committee for Technological Issues of IOSCO[7], which,

[7] International Organisation of Securities Commissions

in cooperation with the Basel Committee for Bank Supervision operating with the Bank for International Payments in Basel, has been dealing with the issue of regulation and supervision in the field of financial derivatives trading on financial markets.

3.3 Main issues concerning regulation and supervision over financial conglomerates and business with financial derivates

As an attentive reader must know a number of issues of regulation and supervision have been already mentioned above, in addition to that they are mutually connected or sometimes even identical.

The key problem of regulation and supervision over financial conglomerates is the fact that these subjects represent heterogeneous group of companies with different kinds of business in individual segments of financial system. Some of these activities are subject to regulation and supervision but some not according to in which countries the companies are located.

Supervision over financial conglomerates deals with relatively wide range of phenomena and processes -the most important is examining of capital adequacy i.e. finding out if the capital of given financial conglomerate is sufficient for covering his business risk, and then a number of other specific problems as e.g. risk resulting from financial relationships inside the conglomerate, danger of so-called infection, examining of transparency of legislation and management etc. Traditional feature of supervision over performance of individual structural components is a practice where each supervisory body monitors only one type of regulated companies without sufficiently developed contacts with other regulators. This practice is not suitable and sufficient for supervision over financial conglomerates because only individual parts of the whole are being monitored and analyzed. It is almost impossible to get an overall overview on business risks concerning financial conglomerates without mutual co-ordination of activities of individual specialized regulators.

Gradual integration of regulation and supervision on national and also supranational level is, in my opinion, one of the most crucial way which is important to be followed in order to minimize if not totally eliminate consequences of this issue.

If we talk about regulation and supervision in the area of financial derivates the cardinal problem is to define and create proper information

basis. One of the results of activities of international organizations that I have mentioned in preceding sub-section is recommendation to apply so-called minimal standard at supervision over firms doing business on supranational level, especially in such cases when the scope of transactions of regulated companies is significant. Elaborating these standards supposes initial compilation of list of items (information) that are considered to be essential for risk monitoring related to using of derivates – loan risk, risk of liquidity, market risk connected with business of derivates. Another step is compiling of these items into catalogue containing compact file of information being considered as a minimal standard.

The aim of supervisory bodies is to pursue a scope using of derivates i.e. monitor volume of businesses being concluded by regulated companies and to identify trends of their use. This information must be sorted out according to individual types of derivates i.e. for swaps, financial futures, forwards a options and simultaneously according to if it concerns stock exchange or out of stock exchange transactions i.e. to monitor the risks really connected with them. It is also important to follow if the regulated companies with shown derivates get on doing business themselves and use them for securing their transactions. Qualitative information is information on organizational structure of regulated companies, on systems of their internal control, on their policy and practice related to measuring and managing of risks relevant to derivates. Supervisory bodies can get this information from various reports being prepared by relevant departments of regulated companies for management of the company e.g. report on internal audit etc.

Without saying that doing business with derivates is connected solely with financial conglomerates of supranational provenience, this connection cannot be ignored and objective requirement of integration of regulation and supervision over financial markets is being strengthened. Another significant relevant aspect is using of derivates by subjects from all segments of financial market, wide scale of markets where transactions with them are being made and also technological integration of complex implementation of these deals beginning from supply and finished with their settlement. In my opinion, everything calls for gradual, thoughtful, multilaterally secured but urgent initiation of integration- first of all where it has not been instituted and where the reached level even requires it.

4. Integration of regulation and supervision over financial markets and its Czech distinctiveness

I have already mentioned two of three basic trends specifying development of financial market –i.e. deregulation and harmonization. I dare say some notes on this issue. Supporters of liberal conceptions that mind any regulations are quite benevolent about regulation of financial market but if they hear about integration they are usually very critical. I would like to assure them of the fact that for most theorists and practicians of regulation of the financial market tendency for deregulation is fundamental and that integration can be understood as removing of overlap and useless requiring of unimportant information, bureaucracy and petrifaction of unneeded and obsolete matters but also as objectively essential step enabling deeper knowledge of substance of regulated, faster reaction to new subjects, objects, processes and relations and problems connected with this origin, higher level of accepted solutions, larger share of positive regulation and increasing its effectiveness.

As for the trend of harmonization, it is, in my opinion, the crucial one for understanding of objectiveness of integration of regulation and supervision as a form of its harmonization with objective developing trends of financial markets having been mentioned above. Integration, internationalization and globalization of financial markets requires the same level of regulation and supervision. The most important things is that this simple relation -that is not simple from the perspective of its practical implementation, must be understood by relevant state authorities and first of all politicians and enable its realization.

4.1. Existing procedures of integration used in selected countries

The contents of this paper cannot serve as an entire description of all existing procedures and changes in organization of regulation and supervision in individual national economies nor detailed specification of one of those. It would be beyond capabilities of this conference as well. Therefore I refer my readers to relevant parts of publication[8] having been issued before and drive our attention to several of given countries.

At present, working classical mega-regulators are to be found in Great Britain, Germany, and Austria. Institutions like FSA, BAFin and FMA are well-known to specialists.

[8] V. Pavlát, A. Kubíček: The Regulation and Supervision of Capital Markets, str. 67 - 100

In Great Britain where the process of integration was finished as of December 1st , 2001 there was a change in responsibilities of Bank of England that saved its responsibility in the area of stability of financial system but responsibility concerning supervision over financial market has been transferred to FSA. Co-ordination of activity among the central bank, FSA and ministry of finance has been agreed on the basis of accepted memorandum. All the three institutions meet regularly on Permanent Committee discussing all system problems.
In Germany, an increasing significance of integrated financial strategies and financial conglomerates was clearly defined reason for origin of BAFin. A reform of German system of regulation and supervision was supported by novella of the main legal norms related to financial sphere: Act on Banks, Act on Supervision over Insurance Companies, Act on Security Transactions and Act on Stock Exchange of Securities. As for the relation between BAFin and Bundesbank in Germany exists so-called dual system. According to this system Bundesbank participates in bank supervision in co-operation with Bundesinstitution for supervision over financial services. "By comparison with some ideas existing in CR, the Bundesbank does not perform key function of banking supervision it is done by BAFin because only it is authorized by executive functions."[9]

In Austria there has been the sole regulator – FMA since April 2002. Austrian federal ministry of finance transferred all responsibilities in the area of banking supervision, supervision over security market, insurance companies and pension funds. Responsibilities and rights of this institution have been stated in Act on Supervision over Financial Market.

4.2 Specifics of integrating the regulation and supervision of the financial market in CR

The first official and generally valid document, in which the intention of creating a certain level of an integrated relationship among individual organs of the regulation and supervision of the Czech financial market was simply formulated, was represented by the 15/1998C/L Law about The Comission for Securities and changes and completion of special laws, especially its Part 6 "The Cooperation with Other Institutions and Administrative Bodies", which defines in §§ 16 – 20 the basis and forms of

[9] Peter Baier: Šance a rizika při vytváření integrovaného finančního dozoru v ČR, Pojistný obzor 9/2004, příloha

mutual cooperation of KCP (Commission for Securities), ČNB (Czech National Bank) and MF ČR (Ministry of Finance CR) and is more specific about it in the relation of KCP to individual above mentioned partners and in addition to The Chamber of Auditors of The Czech Republic and to relevant administrative bodies and institutions of other states with the competence in the area of the capital market regulation. It is also necessary to mention a completion of the Law about The Czech National Bank with § 60a worded this way: "The Czech National Bank in cooperation with the Ministry of Finance and the Comission for Securities will create a system of mutual cooperation in the capital market area at the latest in three months since the operation of a special statue (1 April 1998, AK remark). No substantial changes were done in the mentioned provisions of the 15/1998C/L Law with the exception of § 20 – International cooperation, which was cancelled and with a substantialy wider extent included into § 26 – The Duty of Discreetness and International Cooperation.

While preparing new laws compatible with EU Laws which came into force on 1 May 2004, the problems of integrating the regulation and supervision were already discussed but it was underlined in the government proposal of the law about the entrepreneurial activities on the capital market that: "The problems of dubble supervision will be solved only in the new conception of a consistent national supervision of the financial market."[10]

Then because of the above mentioned fact there was a surprising contribution of the deputy minister of finance of that period, Ing Jaroslav Šulc, CSc, at an international conference held by the College of Finance and Administration with the subject "The Regulation and Supervision of the Financial Markets" on 24 – 25th June 2003, where he gave to the surprise of other supervision bodies – ČNB (Czech National Bank), KCP (Commission for Securities),The Office for Supervision of Cooperative Savings Banks and other participants, too an integral proposal of the integrating of the regulation and supervision of the financial market in CR with enough arguments, though not fully detailed.[11]A contribution of doc. Ing Jan Frait, CSc, the senior director and a member of bankers´board ČNB was not so surprising. The contribution was called "The bank supervision and the stability of financial system" and was presented at the conference held by VŠB-TU (Mining University) Ostrava 3 September 2003 with the subject "The Financial Management of Firms and Financial Institutions", from which I would like to give at least a quotation that in my oppinion is possible to be taken as a

[10] The government proposal of the law about the entrepreneurial activities on the capital market, pg 122, www.sec.cz
[11] The regulation and supervision of financial markets, The international conference file, pg 40-46

perfect prediction of contemporary stage in this area:"Countries which decided to create an integrated supervision institution as a more or less autonomous part of the central bank chose this way a solution which uses natural preferences of the central bank it smartly eliminates potencional conflicts and risks at the same time."[12]It is possible to characterize the end of the year 2003 from the point of view of the development of oppinions in the problems in question by a quotation from the daily papers Právo: " The financial market in the Czech republic will be supervised from 2009 – 2010 only by one institution instead of current four ones. The supervision of cooperative savings banks and banks should be united in two years, the control of insurance companies and pension funds will be amalgameted with the supervision of the capital market at first, in 2006.The two risen institutions should be united at least before the acceptance of euro."[13]

During the remaining part of the year 2003 and the beginning of 2004 the Ministry of Finance CR was taking care especially to the activities related to accepting, publishing and ensuring a without-problem operation of new laws related to regulating capital market, which came into force on 1 May 2004 – the Law of trading on the capital market, the Law of group investments, the Law of bonds and so called Law of changes, and at the same time the problems of the integration and supervision were taken more care.

The result of all negotiations, which took part in that time, was in my oppinion a very serious decission which accepted the objectivity of the proces of integrating the regulation and supervision of the financial market and at the same time it took into consideration the real stage of the development of this market in CR, too, it estimated correctly the possibilities and the time horizon of its future development at last but not at least the deepness and the extent of all existing risks and necessary preparing and realizing steps ensuring the implementation of this objective trend into the Czech economic system without – of course while continuously monitoring, analyzing, evaluating and eventual correcting realized steps - redundant and its substance devaluating consequences. This determination was adopted by the Czech government valid decision on 12 May 2004 nr 452 and besides others individual phases of integrating and organizational steps related to their realization were determined here. In correspondence with the above mentioned decision the Ministry of Finance prepared a government law proposal, the aim of which was the realization of the first period of the integration – uniting the supervision of the capital market (KCP) and the supervision of insurance companies for pension additional insurance (MF)

[12] www.cnb.cz
[13] Právo, 25/11 2003

into the new originated Comission for the financial market and transfering the supervision of cooperative savings banks to ČNB. This proposal was adopted by the government in the decision nr 611 on 21 June 2005. First reading took place at 45th meeting of the Parliament and the proposal was commanded to be dealt with by the budget committee and by the permanent commission for banking, which has not been done yet.

On the basis of the above mentioned assessment, I must state that I was very surprised by the government resolution no.1079 from August 24, 2005 on the change in the intention to integrate the state supervision of financial market into a single institution[14] and by the reasons for that change as mentioned in part III of the document ref.no.1338/05 that was prepared by the Ministry of Finance and served as a basis for government proceedings.[15]

The essence of the proposed change is a significant shortening of the integration process - it should be fully completed in 2008 - and with effect from April 1, 2006 all the supervision should become an organizational part of the Czech National Bank.

I can agree, though with some reservations, with the views of the Securities Commission in its press release from August 11, 2005 and especially in the following materials: "Institutional arrangement of supervision - key factors" and "Alternatives to integrated supervision arrangement in the CR"[16], prepared by the Securities Commission.

Now let me mention a few of my own comments and doubts about the proposed change, which, I hope, the Parliament won't pass. I have formulated them as questions for the authors of the material for government proceedings. "Are you sure that

- the current level of development of the Czech financial market really requires
  acceleration of the integration process of its regulation and supervision?
- it is really the best solution to transfer all the secondary regulation and all the
  supervision to an institution whose main mission lies somewhere else and where
  regulation and supervision will always be on the second place at the

[14] www.vláda.cz
[15] www.mfcr.cz
[16] www.sec.cz

best, although
a similar solution has already proved inappropriate?

- this transfer is sufficiently justified by the current importance of banking institutions
  on the Czech financial market or even by the possibility of higher level salaries in
  the Czech National Bank?
- passing the legislation enabling the integration represents a sufficient legislative
  basis for such a performance of regulation and supervision that would enable
  an efficient fulfillment of the objective mission, targets and tasks and also
  the development of regulation and supervision?
- it is correct to speak exclusively about the integration of supervision if supervision
  is mainly "an operational and feedback institute" for primary and secondary
  regulation and the material mentions only primary and secondary legislation, maybe
  for fear of the requirement to include primary regulation in the integrated system?
- it would not be really better to establish a relatively new and independent institution
  of secondary regulation and supervision, on the right foundations and at the right
  time, entitled with all the necessary rights and obligations which would enable it
  to fulfill the tasks concerning its mission and target?

Understandably, there would be a lot more other questions, comments and topics, but let's wait for the answers to the questions raised so far before we decide to formulate others. In that way the other questions will be of higher quality.

References

[1] V.PAVLÁT, A.KUBÍČEK: Regulace a dozor nad kapitálovými trhy. Praha: VŠFS, 2003, ISBN 80-86754-13-8.

[2] P.MUSÍLEK: Trhy cenných papírů. Praha: Ekopress, 2002, ISBN 80-86119-55-6.

[3] V.PAVLÁT a kol.: Kapitálové trhy. 2.vyd. Praha: Professional Publishing, 2005, ISBN 80-86419-87-8

[4] Regulace a dozor nad finančními trhy. Sborník z mezinárodní konference. Praha: VŠFS, 2003, ISBN 80-86754-04-9

[5] Aktuální vývoj finančních trhů jejich regulace a dozor. Sborník z mezinárodní konference. Praha:VŠFS, 2005, ISBN 80-86754-39-1

[6] PETER BAIER: Šance a rizika při vytváření integrovaného finančního dozoru v ČR. In: *Pojistný obzor.* 2004, vol. 81, no.9, app.

[7] www.sec.cz; www.mfcr.cz; www.cnb.cz; www.vlada.cz;

THE ROMANIAN CAPITAL MARKET IN THE CONTEXT OF EUROPEAN INTEGRATION

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Abstract

This paper tries to identify the perspective of the romanian capital market in the context of european integration. The romanian capital market is an emergent market very attractive to foreign investors seeking international diversification and high profits. The major problem that investors have to face is political risk by which we refer to changes in tax policy and changes in the business climate of the country. The romanian capital market needs to provide a more stable environment for foreign investors in the near feature. Even if before 2000, the activity of the stock exchange was very weak, after that year, the capital market registered a sustained growth. This denotes investors' interest on romanian securities which have evolved to meet the changing and complex needs of the participants in the financial system.

Keywords: : *emergent market, european integration*

1. Introduction

The transitional countries of Central and Eastern need an inflow of foreign capital. The economies need high rates of investments and there is not enough domestic capital. The transition was accompanied by a strong decrease of the saving rate, caused by the liberalization of the markets, by the increased supply of goods and the real depreciation of the savings by the upcoming inflation. The need of investments being at a higher level then the economic possibilities of the countries the solution is the resort to foreign capital either by direct capital investments[1] (participation to the incorporation or development of an enterprise, in any of the legal form set by low, the acquisition of shares of the different types of companies, except for portfolio investments, the setting up or development of a branch by a foreign corporation) or by portfolio investments (the acquisition of securities on the organized and regulated capital markets). The foreign direct investments can substitute the national saving, soften the problems of the capital markets and sustain economic growth.

2. Considerations regarding emergent markets

In these days of high stock market volatility, the question of how to reduce risk is fore-most in portfolio manager's minds. Since Solnik[2] (1974) it is known that international diversification is one way of the best ways to achieve this goal.

There is a reduction in risk for a portfolio that includes foreign stocks, so rational investors should invest across borders. Adding international to national investments enhances the power of portfolio diversification. Even individuals can easily invest internationally. Many mutual funds cater to the demand for international diversification. There are separate index funds for Europe, the Pacific Basin and emergent markets.

Having too many choices, marketers face the challenge of determining which international markets to enter and which are the appropriate marketing strategies in the countries they are planning to penetrate in order to diversify their portfolios.

Like other transition countries, Romania is considered an emergent market.

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[1] According to the Government Emergency Ordinance no. 92/1997 in Romania

[2] Solnik B., 1974, Why Not Diversifying Internationally Rather than Domestically?, Financial Analyst Journal, July-August

Broadly defined, an emergent market is a country making an effort to change and improve its economy with the goal of raising its performance to that of the world's more advanced nations. These countries try to make their economies strong and more open to international investors, and more competitive in global markets but they face lots if problems in order to achieve these goals. Anyway, most nations have something of value for international trade in terms of natural resources, labor, technology, location or culture.

Emergent markets are an increasing part of today's investment opportunities but so far have been taken into account primarily by global institutional players, who having the opportunity to make sizable allocations have selectively invested early in the most promising sectors to obtain high returns in very short time even if the risk is also high.

Investors are attracted by above average returns but many of them remain hesitant to participate due to a lack of understanding of the market, restricted access to research, minimal corporate information, risks associated with yet under-developed market-economies and the need for liquidity. Still some international investors favor emergent market stocks and bonds because of the potential high return in a relatively short period of time. There is a great deal of risk involved in these investments because by definition emergent markets are in a state of transition and subject to unexpected political and economic upheavals. The value of their stocks, bons, and currency change drastically and without notice.

Some of the more common risks of investing in emergent markets include:

- Political risk: The process of modernizing the economies and systems of emergent markets does not represent a steady or predictable process.
- Legal and regulatory transparency: Every country has a system for governing development. It goes without saying that an improper appreciation for how these systems work within a specific country could have a severe impact on investment returns and the problem is that frequently there is a lack of such transparency.
- Liquidity concerns: Lack of central databases as well as public records of transactions means that there is a deficiency of market pricing information to make comparisons as well as drive transactions. Reduced market transparency also means that transactions take longer to close. Word of mouth selling methods because of a lack of a database driven listing service impedes

transactions and liquidity. This is a serious problem that undeveloped market have to face.

- Infrastructure
- Currency Risks
- Imperfect fundamental data and research information
- Possible enforcement difficulties.

3. The Romanian Capital Market

3.1 Legal framework

Capital market organization in Romania is based on principals of investor protection, administrative supervision, and self - regulatory organizations, and principals of specialization of activities performed and limited contractual freedom.

The design and implementation of the regulatory framework of the capital markets in Romania began in 1994. Ten years ago, the Romanian capital market had a widely dispersed shareholder structure, an insufficiently regulated over-the-counter (OTC) market, and six significant players (the State Ownership Fund and five Private Ownership Funds) on the Bucharest Stock Exchange and on RASDAQ. The National Securities Commission (CNVM) had been created to administer and control compliance with the Securities and Stock Exchanges Act (Law 52 / 1994), as an autonomous administrative authority which is directly subordinated to the Romanian Parliament.

The main laws that regulate Romanian capital markets are:

- Law 52/1994 on the securities and stock exchanges;
- Government Ordinance 24/1993 on regulation for the establishment and operation of open investment funds, financial investment companies, depository companies, and investment administration companies;
- Government Ordinance 19/1993 regarding the over-the-counter transactions of securities and organisation of brokerage institutions;
- Government Ordinance 20/1996 regarding venture capital funds;
- From the 9 of April 2002, a new package of Emergency Government Ordinances are regulating the Romanian capital

market (Emergency Government Ordinances No.25 - 28/13.03.2002).

- On July 29, 2004, a new consolidated Romanian Capital Markets Law (Law no 297/2004, "the Law"[3]) became effective. It implements the directives of the European Union in creating and developing a capital market for transactions of modern financial instruments.

The institution building process consisted in:

- ✓ Establishment of the legal framework (Law no. 52 and Law no. 83) and capital market regulations which was a extremely large and difficult process started in 1992 and not finished even today even if important steps were made;
- ✓ Establishment of the competent authority, Romanian National Securities Commission (N.S.C.) as the autonomous administrative authority, which is as we mentioned above directly subordinated to the Romanian Parliament:
  - ♦ The National Securities Commission (NSC) is the market's main rule maker and supervisor;
  - ♦ NSC is responsible for the all operation on the Romanian securities markets, the protection of investors against unfair, abusive, and fraudulent practices, the circulation of information regarding securities, holders and issuers, and the establishment of a legal framework for brokerage activities;

[3] The Law respects Romania's obligations regarding the negotiation of chapters on the free movement of services, the free movement of capital and the Economic and monetary union. The law encompasses the requirements of Council directive 93/22/EEC on investment services, Directive 97/9/EC of the European Parliament and of the Council on investor-compensation schemes, Council Directive 85/611/EEC on the coordination of laws, regulations and administrative provisions relating to undertakings for collective investment in transferable securities (UCITS), Directive 98/26/CEE of the European Parliament and of the Council on settlement finality in payment and securities settlement systems, Directive 2003/71/CEE of the European Parliament and of the Council on the prospectus to be published when securities are offered to the public or admitted to trading, Directive 2001/34/EC of the European Parliament and of the Council on the admission of securities to official stock exchange listing and on information to be published on those securities, Directive 2003/6/CEE of the European Parliament and of the Council on insider dealing and market abuse, Directive 2002/65/EC of the European Parliament and of the Council concerning the distance marketing of consumer financial services, and Council Directive 1993/6/EEC on the capital adequacy of investment firms and credit institutions.

- ♦ NSC set up the size of guarantee funds on both primary and secondary markets against failure of payment.

✓ The market's institutions, as follows:

- ➢ Bucharest Stock Exchange (BSE);
- ➢ RASDAQ (the OTC market, created to accommodate the trading of shares from the mass-privatization process; quote-driven market);
- ➢ National Corporation for Clearing, Settlement and Depository (the clearing-settlement corporation for the trades executed on RASDAQ);
- ➢ Independent Registrars;
- ➢ The National Union of the Collective Schemes Organizations (i.e. Union of Mutual Funds).

The **National Bank of Romania**'s main involvement in the functioning of the capital markets refer to authorisation of clearing and custodian banks, in co-operation with the NSC and cash settlement banks for both equity markets.

The **Bucharest Stock Exchange (BSE)** was initially established in 1882, but closed in 1948 following the nationalization of the private property.

BSE was reopened on **1995**. BSE is a legal entity, a self – regulated body. Trading is carried out through authorised securities companies that are members of the Stock Exchange Association-SEA. The executive body is the Exchange Committee (EC) elected by SEA. The Exchange Committee and the General manager of BSE are approved by NSC that designates a General Commissioner who acts as an observer at the Exchange Committee's Meetings but can propose the cancellation of any decision issued by EC.

The BSE has three listing sectors: corporate securities, public securities and international The corporate sector of BSE is organised into two * qualitative* levels, namely First Tier and Base Tier, with different listing requirements. All listed are required to report quarter and annual financial results. The Bucharest Exchange Trading-BET index launched on September, 1998 monitors first-tier's ten listed stocks, while the BET-C (composite) index, launched on April, 1998 follows the performance of the entire market.

RASDAQ- The Romanian Association of Securities Dealers Quotation or Romanian over-the counter- OTC – market is the second segment of secondary capital market which tends today to merge with the **Bucharest Stock Exchange (BSE).** The Romanian OTC market was

established on September 1996 along the lines of US NASDAQ. The official index of the RASDAQ called RASDAQ Composite was lunched on July 1998. It is a market capitalization index, monitoring all the stocks listed on the OTC market.

In December 1994 the **Sibiu Monetary-Financial & Commodities Exchange (SMFCE)** is a very important Romanian exchange which was founded and in July 1997 it became the first financial futures and options exchange in Romania.

Other structures and institutions acting on Romanian Capital Market:

- Open Investment Funds established through a civil partnership contract;
- Risk Capital Funds set up as civil partnerships without legal personality or as investment joint-stock companies
- Investment administration companies organised as joint-stock companies for the administration of the open investment funds or investment companies
- Depositing companies, joint-stock companies that perform depositing activities for investment funds and companies
- Collective securities investment companies, organised as joint-stock companies, that gather financial resources and invest them in securities
- Authorised independent registers and independent private register companies

All this structures are authorised and supervised by NCS.

3.2 The evolution of the Romanian Capital Market

3.2.1 The effect of privatization on the Capital Market

Romania's capital market was mostly influenced by the way in which privatization was conceived and implemented. The first stage of the privatization process in Romania consisted of the conversion of state-owned companies into commercial companies. As part of the so-called institutionalizing process, six new entities were founded to smooth the progress of the privatization process: the State Ownership Fund (SOF), and five regional Private Ownership Funds (POFs). The SOF retained a 70 percent stake in these companies administering them on behalf of the

Romanian State. The remaining 30 percent stake in the newly created companies was distributed to the POFs under regional and sectoral criteria, which meant that their portfolios consisted of shares in both big and small companies. The POFs acted as administrators of the interests that were distributed to the citizenry.

In the second stage of the privatization process, in August 1992, tradable Certificates of Ownership were distributed to Romanian citizens (15.5 million). The Certificates of Ownership were freely tradable, although no organized market for them existed – similar to the situation on Wall Street before the Buttonwood Tree Agreement of 1792. The Certificates could also be exchanged for shares but only through either a MEBO privatization (in which the employees became owners in the company) or an issuance in an initial public offering (IPO). Statistics show that the MEBO method was used extensively since its start in 1994, with around 1,500 companies having been sold to associations of employees and management for Certificates of Ownership and/or cash from the POFs, and for cash from SOF. In March 1995, 113 IPO's were launched. The first listed stocks on the Bucharest Stock Exchange came from among those companies. In the same period, other companies were sold directly to strategic investors.

The scarcity of domestic capital, the inability to attract foreign investments, and the bureaucracy resulted in a disappointingly low participation in privatization efforts. As a result, in June 1995, a new Mass Privatization Program was commenced. This time, 49 percent to 60 percent of the shares in 3,905 companies were on offer. These companies were the remaining ones from the initial 6,280. Another 800 companies were retained by the SOF to be sold directly to foreign and local strategic investors. New, nominative, non-tradable vouchers with ROL 975,000 nominal value were allocated to 17 million citizens.

In the third stage, new vouchers were issued which, together with the Certificates of Ownership, could be exchanged with the shares of companies or shares in POFs. Each citizen had the right to exchange their vouchers in ROL 1.0m (approximately US$290 at that time) worth of stock. The number of shares that could have been exchanged by one individual was limited in order to avoid the accumulation of Certificates of Ownership. In March 1996, when the subscription period came to an end, 95 percent of Romania's citizen holders had changed their vouchers for company shares.

The Mass Privatization Program created a widely dispersed shareholder structure for the privatized companies. This created problems for the newly-privatized companies that sought out methods to avoid decisional deadlock stemming from the difficulty in organizing and moderating

shareholder meetings due to the large number of participants, their divergent perceptions, and their total ignorance of economics, law, and the specific industry of the issuer. Meanwhile, portfolio investors gathered vouchers dispersed through the privatization process in order to pass them on to large institutional investors and ultimate acquisition of these packages by majority shareholders. This retail business was conducted by a considerable number of small brokerage firms, pooling the otherwise insignificant stakes of individuals. This process created a sort of boom in the brokerage business, but once it was over many brokerage firms went out of business.

Direct investments were made by purchasing the majority of shares from the SOF. This was followed by acquisitions of minority packages through brokerage firms that had collected shares from individuals. A third stage occurred in some instances in which an offer to the public to purchase all of the shares in a company was made with a view to changing the status of the company from a public to a closed one.

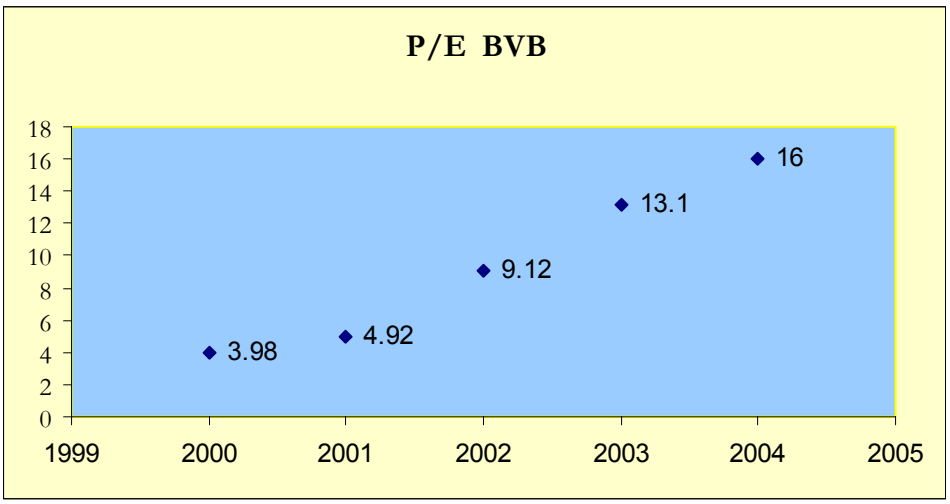
The SOF had to dissolve itself within seven years from its creation by selling 10 percent of its initial stake each year but it developed into a durable institution. In 2000, it was renamed the Authority for Privatization and Management of State Ownership, and merged in 2004 with the Authority for Recovery of Banking Assets under the name of the Authority for Recovery of State Assets. The five POFs were transformed in 1996 by Law 133/1996, drafted by Herzfeld & Rubin, P.C., into Financial Investment Companies (SIFs). Holding in their portfolios significant stakes in various companies, the five SIFs were able to nominate members to the boards of administrators of the companies, which allowed for a concentration of decision-making. Although in some cases the decisions imposed by SIF representatives in the boards of administrators were short sighted, or lacked coherence, the overall effect of their presence on the background of an otherwise widely dispersed shareholder structure was beneficial. Today all five SIFs are listed on the Bucharest Stock Exchange.

3.2.2 The Romanian Capital Market today

The good results registered in 2005 come as a continuation of those seen in 2004, considered to be the best year the Bucharest stock exchange has had since its foundation in 1995. The total value of the transactions in 2004 stood at 600 million euros, with capitalization exceeding 9 billion euros, while the BET index rose by more than 100 percent.

It is interesting to underline the main reason for the increase of the stocks prices. Figure 1 illustrates the evolution of the price/equity index and we can observe that the increase was due to the adjustment of the Romanian index to those of other countries. Between 1979-1999 Romanian stocks were highly under-evaluated.

Figure 1 Price per equity on BVB between 2000-2004



Source:www.kmarket.ro

After a long recess, the year 2004 saw the listing of new issuers on the Bucharest Stock Exchange; these companies had their shares listed here, but they also listed their bonds. Another major event in 2004 was the broadening of a market niche consisting of instruments generating fixed returns. Many people voiced skepticism about the consolidation of this sector, shortly after its establishment in 2001, when a small decline was registered. However, a big step towards the consolidation of this sector was made in 2004, when important banks, such as BRD - Societe General, quoted significant amounts of corporate bonds on the Stock Exchange.

Under the consolidated capital market law, issued in 2004, the Bucharest Stock Exchange was turned from a state owned institution into a joint-stock company. The law also provides for the establishment of a new institution, namely the Investors' Compensation Fund, and enables banks to play the role of middlemen on the capital market, together with financial investment companies. In 2007, any broker from the EU space will be granted access to the Romanian stock exchange.

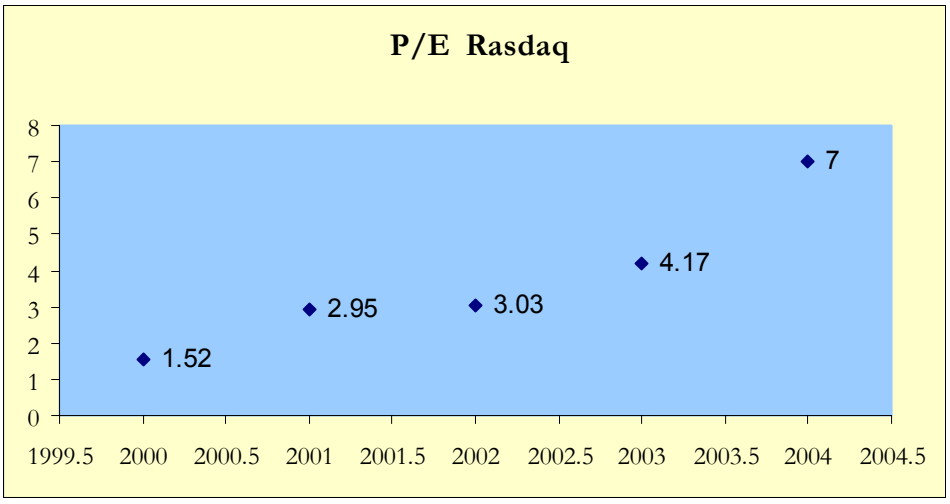
The electronic stock-exchange, RASDAQ, established in 1996 along the lines of the US NASDAQ, also behaved well in 2004. The composite

index witnessed an increase of almost 40%; however, the most important upturn was seen in the Category I and Category II indexes, 60% and 72% respectively.

Also, the stock exchange capital increased to almost 2 billion Euros. The shares of 11 companies are listed in the RASDAQ's Category I; 17 companies can be found in Category II, and the basic category consists of more than 3900 companies. Preparations for a merger with the Bucharest Stock Exchange started last year.

Figure 2 illustrates the evolution of P/E index for stocks listed on Rasdaq and we can observe that the values are appreciatively half of those encountered on BVB.

Figure 2 Price per equity on Rasdaq between 2000-2004



Source:www.kmarket.ro

A very promising market in our country is that of mutual funds. By the types of investment instrument that these investment companies acquire we distinquish[4]:

- Money market funds – are investment companies that acquire high-quality, short-term investment (money market investment). Individuals tend to use money market funds as alternatives to bank savings accounts because they are generally quite safe (although they are not insured, they typically limit their

[4] Reilly F., Brown K., 2000, Investment Analysis and Portfolio Management, The Dryden Press, USA, p.87

investments to high-quality, short-term investments), they provide yields above what is available on most savings accounts, and the funds are readily available.

- Bond funds – generally invest in various long-term government, corporate or municipal bonds. They differ by the type and quality of the bonds included in the portfolio as assessed by various rating services. Specifically, the bond funds range from those that invest only in risk-free government bonds included in the portfolio as assessed by various rating services. Specifically, the bond funds range from those that invest only in risk-free government bonds and high-grade corporate bonds to those that concentrate in lower-rated corporate and municipal bonds, called high-yield bonds or junk bonds. The expected rate of return from various bond funds will differ, with the low risk government bond funds paying the lowest returns and the high-yield bond funds expected to pay the highest returns.
- Common stock funds – invest to achieve stated investment objectives, which can include aggressive growth, income, and international stocks. Such funds offer smaller investors the benefit of diversification and professional management. They include different investment styles, such as growth or value, and concentrate in alternative-sized firms, including small-cap, mid-cap, and large-capitalization stocks. To meet the diverse needs of investors, funds are being created that concentrate in one industry or sector of the economy, such as chemicals, electric utilities, health, housing and technology. These funds are diversified within a sector or an industry, but are not diversified across the total market. Investors who participate in a sector or an industry fund bear more risk than investors in a total market fund because the sector funds will tend to fluctuate more than an aggregate market fund that is diversified across all sectors.
- Balanced funds – invest in a combination of bonds and stocks of various sorts depending on their stated objectives.

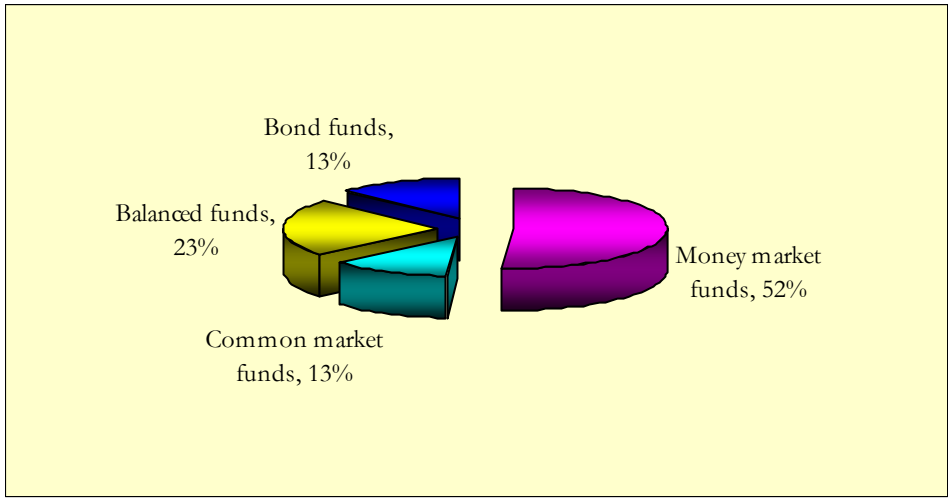
It isn't natural to compare the performances of a money market fund with those of a balanced fund or to compare the risk level of a bond fund with that of a common stock fund. They respond to different needs, the risk level is different and so is the return.

The Romanian Capital Markets Law (Law no 297/2004) defines intermediaries as investment firms authorized by the CNVM, credit institutions authorized by the National Bank of Romania according to

relevant banking laws, and any other such entities authorized in Member or non-Member states to carry out investment services. The financial instruments which are the object of such investment services are: transferable securities, units in collective undertakings, financial market instruments including governmental bonds with a less than 1 year maturity period and deposit certificates, financial futures contracts, forward interest rate agreements, options, derivatives on commodities, and any other instrument admitted to trading on a regulated market in a Member State or for which a request for admission to trading on such a market has been made. In addition, the new Law waives the obligation of SSIFs to get prior authorization for each market. Intermediaries can apply for authorization, granted by the CNVM, permitting the provision of one or more core or non-core services. The minimal capital requirement for these entities ranges from Euro 50,000 to Euro 730,000 depending on the services intended to be provided. The law provides for a gradual schedule until September 30, 2006 for these entities to augment their capital. Supervision of minimal net capital requirements is made through the monthly financial reports that assess the risk of investments in the different categories of financial instruments.

In the figure bellow are presented the market quotas of each type of Romanian fund in march 2005 and we can observe that money market funds were the majority.

Figure 3 Funds Market Structure in may 2005



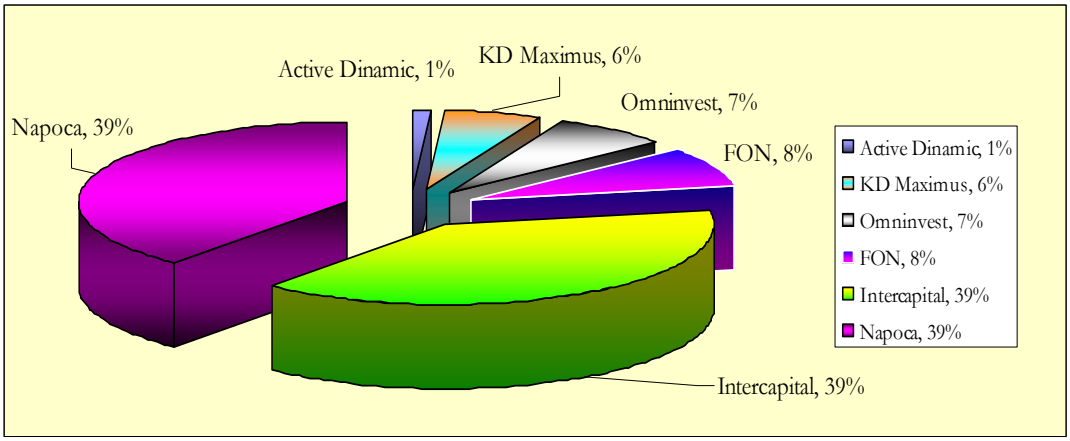
Anyway, the development of financial instruments on the Romanian capital market, the growing liquidity at the stock exchange determine a better

flexibility of investment funds with regard to the investments they are able to perform.

In consequence, these are able to diversify or to specialize on certain type of financial investment in order to offer the investors optimum rates of return in the risk parameters that they choose, and the market quotas the funds detain are likely to change.

Considering the stock exchange growth in the last years, common stock funds have offered high returns, several times higher than the interest offered by banks. The risk level of such funds is indeed big and their performance depends on the general evolution of the stock exchange. In 2004 the best results were achieved by two funds Napoca and Intercapital witch hold together 80% of the Romanian common stock funds market.

Figure 4 Common stock funds market structure



Anyway, even the other common stock funds have offered very good returns during 2005 and have good chances to become a strong sector in the conditions in which investors have matured and they prefer to offer their money to a fund administrator rather than to deposit at a bank or to invest directly at the stock exchange.

The administrators of Romanian common stock funds are very optimists and consider that in a short time these funds will become a majority on the market. This will signify an approach to the situation in UE, where the majority of investment funds invest on the stock exchange and create well diversified stock portfolios.

In the first eight months of the current year, balanced funds and common stock funds have attained benefits of over 14%, the bonds funds of

7.6% and the money market funds have offered to investors benefits of only 5%, below the interest rate which was of 5.2%. The interest for these common stock funds is very high and it is expected to appear more common stock funds with bigger levels of risk than the present ones as it seems that Romanian investors do not consider risk when investing, they only expect good returns.

4. Conclusion

With EU accession set for 2007, Romania represents an attractive emergent market for institutional investors. With a capital market that has flourished in the past years far beyond most expectations, Romania promises generous returns to investors willing to overcome the difficulties of doing business in an emergent market. A comparison of international trends with Romania's legal regime shows that only certain investment techniques and instruments are available in Romania and some new legislation is still necessary to nurture the interest of foreign investors in the local market.

An important step towards the harmonization of Romanian legislation in view of the country's accession to the EU was taken in July 2004 with new securities and capital markets legislation. The adoption of a consolidated low on capital markets, which aims at further alignment with the acquis on investment services, market abuse and undertaking for collective investments in transferable securities (UCITS) was a major step for the investment services and securities markets in Romania.

The Law provides for the possibility of the providers of investment services to operate on the markets of member countries upon authorizations granted in the country of origin. There are minimal requirements to be met regarding the Investment firms (SSIFs) and the Management companies (SAI) that will grant them the right to provide services in the member states of the European Union.

In Romania, it is upon the authorization of the CNVM. These requirements include the sufficiency of the financial resources for the proposed line of business, the standard of professional expertise and ethics of the administrative/executive personnel. Detailed provisions are set forth regarding the capital adequacy, the membership in the Investor Compensation Fund (for the SSIF) and prudential rules for the fund administrating firms (in accordance with Directive 85/611/CEE regarding undertakings for collective investment in transferable securities). The “Single Passport Principle” on issuers makes it possible for publicly held companies

to attract capital from the European market as a whole, and once the prospectus for a public offering is authorized in the country of origin, it will be valid for public offerings and/or admission to trading on any regulated market with the EU.

The consolidated version of the Law improves the supervision and the competitiveness of Romania's capital markets. It establishes a solid framework for the development of the Romanian market and its interconnection with European trading and clearing-settlements systems. It is, of course, just that – a framework. Much more will have to happen before the transition can succeed. Indeed, analysts consider that the hardest part is yet to come for CNVM but fortunately, the CNVM has been one of Romania's better-run agencies and there is every reason to believe that its members will live up to the challenge.

References

[1] BROQUET C., BERG A., *Gestion de portofeuille*, Ed. Dunod, Paris,1997. ISBN 2-8040-1398-1

[2] COBBAUT R., *Theory Financiere* , Economica, Paris, 1994.ISBN 2-7178-2686-6

[3] FARREL J. JR., *Portfolio Management*, McGraw-Hill Higher Education, USA,1997.ISBN 0-07-114244-4

[4] Grinblatt M., Titman S., *Financial Markets and Corporate Strategy*, McGraw-Hill Higher Education,USA, 2002. ISBN 0-07-112341-5

[5] Reilly K. F., Brown C. K., 2000, Investment Analysis and Portfolio Management, The Dryden Press, USA, ISBN 0-03-025809-X

[6] Rose S. Peter, 2000, *Money and Capital Markets*:Financial Institutions and Instruments in a Global Marketplace, McGraw-Hill High

[7] www.bvb.ro

[8] www.emdirectory.com/

[9] www.forbes.com/emergentmarkets/

[10] www.kmarket.ro

[11] www.securities.com/

NEW TRENDS IN THE EUROPEAN CORPORATE BOND MARKET AFTER THE INTRODUCTION OF THE EURO

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Abstract

Compared with the United States, bonds long played a minor role as a financing instrument for European enterprises. However, during the past few years this market segment has undergone a sharp expansion and has become more important in corporate financing. The aim of this paper is to explain the transformation in this market and the factors influencing it. The analysis of the corporate bond markets in the individual "old" EU-countries shows dynamic development of the debt market since the introduction of the euro. It provides the evidence that the growing importance of the euro as an international currency has led to the integration of the national markets for corporate bonds and has made the market for euro-denominated issues more attractive for both issuers and investors. The current broadening and deepening of the corporate bond markets in the "old" EU-countries has the positive implications for the development of the debt securities markets in the "new" EU- members.

Keywords: *corporate bonds, bond markets*

1. Introduction

An important feature of a well-developed financial system is the existence of a robust corporate bond market working alongside a sound banking system. The existence of a mature corporate bond market including a deep high-yield bond segment has the positive implications for economic development. It allows corporations to raise funds more quickly and on more flexible terms. The existence of the corporate bond markets complementary to bank and equity finance is particularly beneficial for economies with a large number of small and medium sized firms. The introduction of the euro has opened the possibility for the development of the more integrated European capital market. The single currency, by eliminating exchange – rate risk, has removed the main barriers to integration of the debt markets. Before the European Monetary Union (EMU), the government and private bonds issued in different currencies were imperfect substitutes and traded at different prices. The EMU has eliminated this source of market segmentation.

It is now time, after six and a half years of the existence of the single currency, to give some assessment concerning the impact of the euro on the bond market. The aim of this paper is to show the major trends in the European corporate bond market after the introduction of the euro and to explain the transformation in this market.

The paper is structured into five parts. Section 2 provides an overview of developments in the corporate debt sector in Europe before and after introduction of the euro. Section 3 discusses the issues relating to the impact of the single currency on the supply and demand side of the corporate bond market. The problem of the integration of the European corporate bond market and its prospects is covered in section 4 followed by concluding remarks in section 5.

2. Overview of the corporate bond markets in Europe

2.1 Brief history of the European corporate bond market before EMU

The corporate bonds are debt obligations, issued by private corporations. The companies use the funds from selling of the bonds for a variety of purposes, from building facilities to purchasing equipment and expanding the business. The issuers of the corporate bonds represent various sectors: public utilities, transportation companies, industrial corporations, financial services companies and conglomerates.

The early 20th century was a time of active corporate bond issuance in Europe. Industrialisation, the rapid diffusion and adoption of new

technologies and the development of capital markets to fund economic growth resulted in both supply- and demand-driven bond issuance. The worldwide depression of the 1930s and the Second World War effectively shut the European corporate bond market for nearly 50 years, though domestic credit markets continued to operate over that period. Since 1985, the bond market began to develop and the European corporate bond issuance has increased in relative as well as in nominal terms.

Before the introduction of the single currency, European bond markets were largerly domestic and significantly smaller than those in the United States. In 1998 the value of the total bonds outstanding in the euro area was only 56 per cent of the value in the USA. This size differential existed for both the private and the public bond market. In addition, the volume of the domestic issues of corporate bonds in 1995 was low compared with other developed markets: for example USD 0.1 billion in Germany and USD 6.4 billion in France, compared with USD 20.7 billion in the United Kingdom, USD 77.2 billion in Japan, and USD 154.3 billion in the United States (Prati and Schinasi 1997).

In the late 1990s there was sustained growth in the issuance of bonds worldwide, and Europe shared in this growth of the market especially with much increased corporate bond issuance, representing the second most-active bond market in the world. It is interesting to note that the relatively small corporate bond market in Europe until the late 1990s was mirrored by the greater importance of bank lending. While in the USA bank loans play a negligible role in the financing of large companies, they have been traditionally the dominant source of debt financing for European companies. This feature of European corporate finance began to erode just in the second half of the 1990s.

2.2. Issuing activity in the corporate bond segment after the introduction of the euro

The euro area corporate bond market is the sector in which impressive changes have taken place following the launch of the single currency. In particular, this segment saw the strongest growth in the three years following the introduction of the euro. The size of the long-term bond markets in euro area is presented in Table 1.

Table 1 Gross issues of long-term debt securities by euro area residents by sector from 1998 to 2004 (EUR billions, issues during the year)

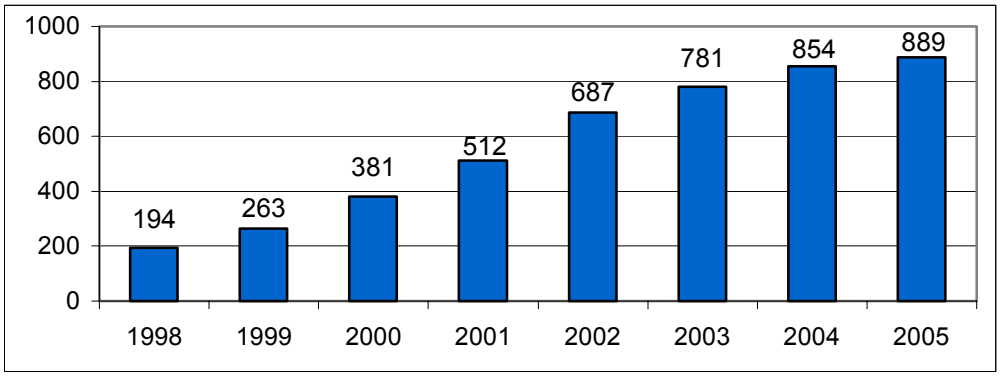
Item	1998	1999		2000	2001		2002	2003	2004	
		EUR	%		EUR	%			EUR	%
(MFIs)	460.4	608.6	43.0	599.1	647.2	40.8	949.5	787.5	866.3	46.8
Non-monetary financial corp.	57.0	141.7	10.0	188.5	242.4	15.3	208.2	203.5	178.3	9.6
Non-financial corporations	**33.7**	**63.4**	**4.5**	**94.6**	**137.1**	**8.6**	**79.8**	**113.6**	**96.9**	**5.2**
Central governments	609.1	602.4	42.5	517.0	558.7	35.2	644.4	711.1	707.9	38.3
TOTAL	1,160.2	1,416.1	100.0	1,399.2	1,585.4	100.0	1,881.9	1,815.7	1,849.4	100.0

Source: ECB (2005d)

As shown, the corporate bond market in the euro area experienced a major change in 1999, when gross issuing volume increased from EUR 33.7 billion in 1998 to EUR 63.4 billion, by almost 90 per cent. The issuance of corporate bonds by euro area residents in 2004 was EUR 96.9 billion. It is slightly below the EUR 137.1 billion recorded in 2001 but significantly above the levels recorded in earlier years. The gross issuance of euro area non-financial corporations tripled since 1998, compared with a growth rate of only 88 per cent in the case of bank bonds. The share of corporate bonds in the European bond market increased from 4.5 per cent to 8.6 per cent between 1999 and 2001. In 2004 the issuance declined to a share of 5 per cent and reflects the higher issuance activity of the monetary financial institutions (MFIs).

The impressive development of the corporate bond market in the euro area is illustrated by Figure 1. From 1999 to 2005 the outstanding amount of the bonds issued by non-financial corporations rose from EUR 250 billion to around EUR 900 billion. Despite this exceptional growth, the gap between the euro area and the United States is still large. The outstanding volume of the bonds issued by the corporations in the US is now around EUR 2.4 trillion (European Commission 2005).

Figure 1 Euro area corporate bond market – outstanding amount (EUR billions)



Source: ECB

According to Rajan and Zingales (2003) the introduction of the euro had a positive effect on the amount of net debt issues. Namely, the amount of debt issues almost tripled after the introduction of the euro. Before the adoption of the single currency the euro area countries had average total net debt issues of almost zero, while the non-euro countries had an average of 1 per cent of GDP. After the introduction of the euro, the non-euro countries remained at the level, while the euro countries jumped to the net issues of 2 per cent of GDP per year.

2.3 Developments in the corporate bond segment in the euro area countries

The greatest issuers of the corporate bonds among the eurozone countries are: France, Germany and Italy. In France during the 1990s, bond market development reflected the increasing importance of the market–oriented financing. In particular, the debt securities segment has been marked by a considerable growth since its creation in 1985, on account of a liberalization policy and the increse in the number of new debt securities. Moreover, the liberalization of the conditions of the issue in 1999 and a contingent rise in the number of foreign holders led to a higher growth (ECB 2002).

Table 2 Amounts outstanding of the euro denominated long-term debt securities by euro area country (EUR billions, at the end of June 2005)

Country	Total	General government	Monetary financial institutions	Non-monetary financial corporations	Non-financial corporations
Euro area	8,244	4,109	2,946	753	437
Belgium	304	231	48	3	22
Germany	2,524	999	1,453	0	71
Greece	171	168	0	1	2
Spain	671	302	171	189	9
France	1,456	838	364	31	222
Ireland	103	31	71	-	-
Italy	1736	1,090	464	141	42
Luxembourg	36	0	36	-	-
Netherlands	807	211	185	377	34
Austria	264	124	119	5	17
Portugal	98	64	21	5	8
Finland	71	49	13	1	8

Source: ECB securities issues statistics

The number of the debt securities issued by non-financial corporations in France expanded considerably over the second half of the 1990s. While non-financial corporations accounted for 15 per cent of the total issuance at the end of 1994, by 2000 this proportion has increased to 18.8 per cent, (or EUR 235.1 billion). The bond issuance strengthened significantly between 1998 and 2000 (by about 100%), in connection with the sharp increase in the need for financing arising in particular from the mergers and acquisitions (M&A) activity. At the end of June 2005 the issuance of long–term bonds accounted for a half of the total issue in the eurozone (Table 2).

The German financial system was, and still is, esentially bank-based, which implies that most corporations are largerly dependent on bank financing. However, after the introduction of the euro and the integration of the national bond markets, the non-financial corporations have obtained an increasing amount of their funding through the issuance of corporate bonds. Since the launch of the monetary union, there has been a sixfold increase in

the German corporate sector's volume of debt securities outstanding in the euro area. Among the larger European economies, this dynamic growth has been outplaced only by Italy (Table 3).

Although German enterprises' outstanding amount of bonds has increased to 6 per cent in relation to GDP, it is considerably lower than in the US and the UK or France where bonds have long played a significant role in corporate financing. The American, English and French non-financial enterprises' outstanding volume of bonds and money market instrument was equivalent to around one-quater of their GDP.

Table 3 Corporate bonds outstanding – an international comparison, September 2003

	Non-financial corporations domiciled in				
Item	Germany	France	Italy	UK	US
Outstanding amount as %-age of GDP	6	23	12	26	26
Percentage market growth since 1993	907	280	1,522	524	63
Percentage market growth since 1998	613	144	1,119	139	22

Source: Deutsche Bank (2004).

In Germany the issuance of corporate bonds is concentrated on a small number of industries. In the first place is the car and air transport industry (28 per cent of the overall volume), followed by telecommunications and IT enterprises (23 per cent) and the energy sector (12 per cent). The average outstanding volume per bond issue in the telecommunications and IT sector amounts to about EUR 1 billion, while the issues of enterprises in the car and air transport sector are on average less than half as large (around EUR 400 million).

The issues consist very largerly of papers which the rating agencies classify as "investment grade". Just under two-thirds carry a rating in the highest category (Aaa to A3). These are primarily the bonds of car, air transport and energy enterprises. Telecommunications and IT enterprises are mostly rated lower, however, with a B rating being dominant. The higher-risk "high yield bonds" accounted for 5 per cent of the bonds outstanding.

3. Impact of the euro on the development of the corporate bond market

3.1 Consequences for the supply side of the market

The introduction of the euro has been an important catalyst for European issuance over the past six years. Although the member states of the eurozone did not formally adopt the single currency until 1999, the euro-denominated issuance commenced two years earlier, in 1997. From an issuer's perspective, the introduction of the euro has provided access to a larger pool of potential investors and has facilitated the comparison of returns offered by various international issuers. Furthermore, the introduction of the euro enhanced the corporate bond market. For example, in the period 2000-2001, the volume of euro issues in the corporate sector increased by more than 100 per cent. In addition, during the late 1990s many European corporations engaged in the mergers and acquisitions and euro bonds provided a means of their financing. The euro bonds were also the attractive sources of funding for corporations because of the low interest rates.

According to Rajan and Zingales (2003) the boom of the corporate bond market after the introduction of the euro was indeed stronger in the euro area than outside. The authors have conducted a simple panel data analysis for a sample of European countries since 1990 and find that the net private debt issues have become significantly larger for countries that adopted the euro. This suggests that the introduction of the euro had a causal impact on the development of the corporate bond market in Europe.

3.1.1 Changes in the issue size, number of issues and the maturities

The national currencies were the main cause of the corporate bond market segmenting in Europe. On the one hand, firms were reluctant to issue large number of bonds denominated in foreign currencies, because of the exchange risk involved in repayments. On the other hand, the demand for bonds denominated in national currencies was limited because institutional investors, such as pension funds, had to face exchange risk as well. In consequence of the euro adoption the average size of new bond issues rose considerably, as the number of very large issues, of EUR 1 billion or more, grew significantly. In the period 1999-2005 the average size of corporate issues has almost tripled. In January 1999, the average size of a corporate bond issue in the euro area was EUR 0.3 billion, but by June 2005 it increased to EUR 0.8 billion. That is 60 per cent larger than the average issue size in the US-market.

Although in general the issue sizes in Europe have increased significantly since 1999, with issues above EUR 1 billion becoming more and more frequent, the institutional investors in particular stay away from the private bond market because of a relative lack of liquidity. While the government bonds issued by the large EU-countries tend to amount to EUR 15 billion to EUR 20 billion per line, the standard size of a corporate bond is only one – tenth of the amount or even less. Nevertheless, some progress has been made: among the corporate bonds the proportion of smaller issues below EUR 500 million decreased considerably from about 40 per cent of total issuance in 1999 to well below 20 per cent in 2003. At the same time, the percentage of issues above EUR 2 billion, which was more than 30 per cent in 2001, also decreased to less than 10 per cent in 2003. These changes show that the newly created euro-denominated bond market, because of its size and high degree of openness, is more able to absorb very large issues than the individual bond markets of the predecessor currencies of the euro. (European Commission 2003).

The number of outstanding corporate issues has also slightly decreased, namely by one-third since the creation of the euro. In January 1999, there were more than 1,600 issues outstanding whereas in June 2005 there were 1,077. This decrease is a global trend not confined to Europe. Over the same period, the number of corporate issues outstanding in the US market decreased by 44 per cent.

Concerning the bond maturities, while the government bonds provide nearly the complete range of maturities from 1 to 30 years, the corporates dominate in the short – and medium – term segments. The proportion of longer maturities of the newly issued bonds rose distincly during the period from 2001 to 2004. In the first half of 2004 there were also a lot of buybacks and bond exchanges in the corporate bond market. In most cases the aim of these activities was to issue bonds with even longer maturities in order to lock in the low interest rates. In the early 2005 Telecom Italia opened the 50-year segment in the euro corporate bond market, just several weeks after the French Treasury had done so in the government bond market (ECB 2005b).

The long maturity market is well developed only in the UK, with the euro market lagging behind. Only 4 per cent of the euro area corporate bond market has maturity over 10 years compared with 50 per cent in the UK-market. A notable feature of 2003 and 2004 was the willingness of euro investors to support the very long-dated issues that had previously only been seen in the UK-market. This highlighted not only the continuing development of the European market at the long end of the maturity spectrum but also demand for lower credit quality at that longer maturity.

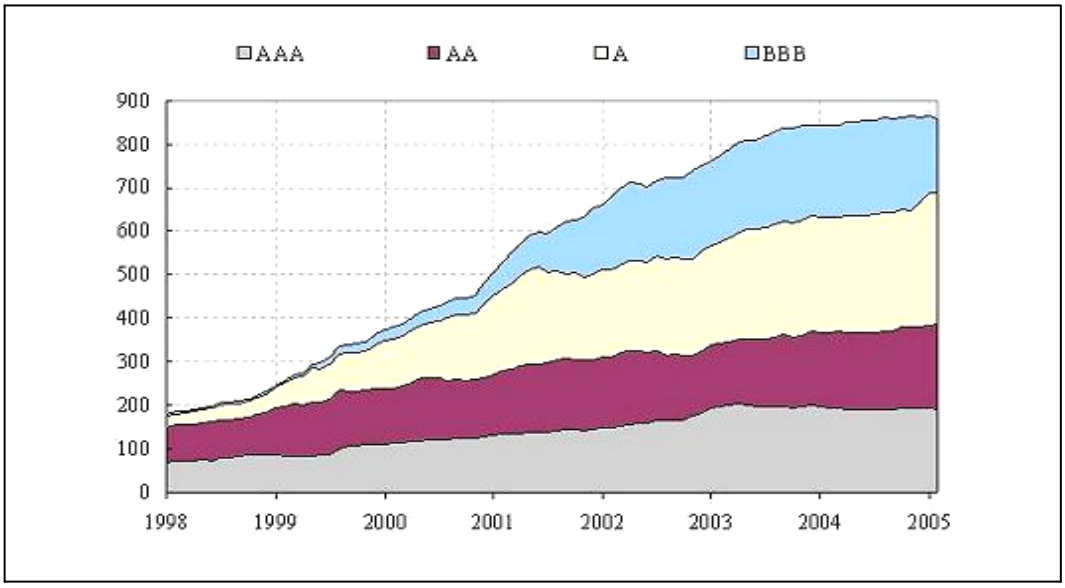
3.1.2 Decrease in the credit ratings profile and the development of the high-yield bonds

The corporates have a wide range of credit rating and fall into two broad credit classifications: the investment-grade and the speculative grade bonds. The speculative – grade bonds are issued by the companies perceived to have a lower level of credit quality compared with the more highly rated investment – grade companies. The speculative – grade bonds tend to be issued by the companies that have troubling fundamentals. While a speculative-grade credit rating indicates a higher default probability, the higher risk of these bonds is often compensated for by higher interest payments or yields.

As the corporate bond issuance in Europe has expanded, the ratings profile of issues has also undergone a change. In particular, the average credit rating has fallen significantly since the EMU. Prior to the launch of the monetary union, the majority of the bonds were classified as AAA and AA issues. After the adoption of the euro, 50 per cent of all corporate bonds issued in 1999 received a single A credit rating and BBB (Luengnaruemitchai and Ong 2005). Since then, the corporate bonds tend to have the lowest credit ratings in the bond market (Figure 2)..

Figure 2 Euro area corporate bond market – outstanding amount per rating category

(EUR billions)



Source: ECB

As Table 4 shows, roughly just under 90 per cent of the corporate bonds outstanding in Europe were classified as investment grade. However, the shift in the distribution away from Aaa ratings has been marked, falling from 22 per cent in 1985 to 7 per cent in 2001. At the same time, the share of issuers in the Aa rating category has grown to 28 per cent. The percentage of rated issuers in the lowest investment-grade and lowest speculative-grade categories has also increased. The speculative-grade ratings have grown from 11 per cent of the total to 14 per cent. The distribution of ratings shows a much higher proportion of B and Caa-rated issuers than in 1985. Nonetheless, the average A2 credit rating of Europe's corporate debt market still remains higher than the average Baa2 rating of its US counterpart. The changes in the credit ratings distribution since 1985 reflects a new issuance in the lower rating categories rather than credit deterioration by existing issuers.

Table 4 Distribution of European corporate ratings, 1985-2001 (per cent)

Rating	1985	1990	1995	2001
Aaa	22.2	29.5	12.3	6.6
Aa	5.6	38.8	33.2	27.9
A	50.0	27.3	41.6	36.3
Baa	11,1	1.4	7.3	15.1
Ba	5.6	2.2	3.1	3.8
B	5.6	0.7	2.1	8.2
Caa-C	0.0	0.0	0.3	2.1
Investment-Grade	88,9	97.1	94.5	85.9
Speculative-Grade	11.1	2.9	5.5	14.1
Total Number of Issuers Outstanding	18	139	382	918

Source: Moody's (2002).

As mentioned above, the corporate bonds tend to have the lowest credit ratings in the bond market and are therefore the most strongly affected by economic downturns. This was reconfirmed after the 2001 economic slump, when many prominent companies (among them British Airways, ABB, Ericsson and Ahold) became "fallen angels", that is they were downgraded from investment grade to non-investment grade (Moody's 2002).

Although the growth of the speculative-grade segment of the European bond market over the last years has been an important feature in the market's development, the speculative-grade segment still represents a relatively small proportion of debt issues. In the euro area, these make up only around 15 per cent of the corporate bond market, compared to around 40 per cent in the USA. However, if one includes the fact that market capitalisation in the euro area is relatively low compared to the USA, Europe may by said to be an emerging market for the high-yield bonds i.e. below the investment-grade rated.

The high-yield bonds form an interesting segment of the financial market for the following reasons:

Firstly, these bonds provide a larger degree of flexibility than the bank loans, which are subject of more strict conditions. In consequence, a high-yield bond market can provide funds complementary to bank-based debt or equity.

Secondly, financing via high-yield bonds can encourage a reallocation of funds from economically declining sectors, to fast-growing sectors with urgent needs of funds. Consequently, a well-developed financial sector, in which the bonds are either rated below the investment grade or unrated, should facilitate the transition of medium-sized firms into large enterprises.

Thirdly, the market pricing of speculative-grade bonds takes place by the interplay of market participants. In this way a financial system with a well-developed high-yield bond market provides discipline for lower credit quality of the corporations.

Finally, the high-yield segment of the corporate bond market can be a useful source of information on the future economic activity and on the current credit conditions in the economy. (Bondt and Marques 2004).

Unlike in the US, where the high yield bond market developed in the early 1980s, in Europe the high-yield segment of the corporate bond market is a phenomenon of the late 1990s. The European high-yield bond market had shown the first signs of developing in 1997 and began to grow in the run of the introduction of the euro. The European high-yield bond market was established finally after significant issuances to fund the telecom market in late 1999 and is constantly evolving. In 2003 the issuances reached the record levels of 1999 when the market took-off. In the United Kingdom, the high-yield segment of the corporate bond market grew quicker than in the euro area, benefiting from having a more market-based financial structure. Another determinant of the high-yield bonds issuance are mergers and

acquisitions. During the 1990s there was an increase in the amount of M&A which picked in 2000.

The high yield bond market has become an increasingly important source of capital for European corporations. At the end of 2003 the share of these bonds accounted for 7 per cent of the total corporate bond market. The size of transactions has increased alongside the greater liquidity in this market (notably with Heidelberg Cement EUR 700 million, Vivendi Universal EUR 325 million and USD 935 million, EMI EUR 425 million and Eircom EUR 835 million and USD 250 million). The performance of high yield bonds has significantly benefited from the general improving credit environment and has been demonstrated by both high returns for investors and European spreads braking the 400 basis point barrier (the traditional minimum spread seen for a non-investment grade credit (KPMG 2004).

The European high yield market has maintained a very important diversification trend. In terms of the industry structure, the telecommunication sector was initially the dominant force in this field. At the end of 1999, it held a roughly 50 per cent share of the European market for high-yield bonds. However, in 2003, only 10 per cent of the issuances were telecom related and 61 per cent were the issuers of other industries.

In terms of ratings, in the period 1999-2005 the quality of issued high-yield bonds in Europe has declined. In June 2005, the percentage of B-rated bonds amounted to 33.5 per cent, BB-rated 49 per cent and CCC-rated 12%. The current composition of the euro high yield market is more reflective of a mature market.

Table 5 Default rates in the period 2003-2004 (per cent)

		Global	U.S.	EU[1]
a.	**2003**	e.	i.	m.
b.	Investment-grade	f. 0.10	j. 0.00	n. 0.28
c.	Speculative-grade	g. 4.89	k. 5.55	o. 3.42
d.	All rated	h. 1.89	l. 2.31	p. 0.82
q.	**2004**	u.	z.	dd.
r.	Investment-grade	v. 0.00	aa. 0.00	ee. 0.00
s.	Speculative-grade	w. 1.83	bb. 2.30	ff. 1.23
t.	All rated	x. 0.70	cc. 0.99	gg. 0.23
		y.		

[1] European default rates refer to EU-15 countries

Source: Standard & Poor's (2005).

In 2003, the distressed and defaulted debt represented 32 per cent of the total high-yield market in Europe. This was down considerably from 58 per cent of the market at the end of 2002 due to defaults in the

telecommunications, technology and energy industries and down from almost 100 per cent at the end of 2001. This decline follows the global trend in default rates. As presented in Table 5, the default rates for global speculative grade fall from 4.89 per cent in 2003 to 1.83 per cent in 2004, with the comparative fall in Europe from 3.42 per cent to 1.23 per cent. It is interesting to note that at the end of 2004, the American and European default rates were similar, with the European default rate of 1.23 per cent and the American one at 2.30 per cent.

The European defaults, similar to those in the US, were concentrated in the media and telecommunication industry. For example, telecom and media issuers accounted for over 88 per cent of total defaults in 2002. In 2003 however, defaults were much more diversified. In fact, the share of telecom and media defaults dropped to less than 10 per cent. In 2003, although the defaults were somewhat fairly distributed across the industry categories, the consumer products industry was responsible for over 50 per cent of the total European default volume. Among the EU-15 countries Italy had in 2003 the largest total number of defaulting issuers (5) and volume (EUR 5.9 billion) due entirely to the default of Parmalat and its subsidiaries.

3.2. Consequences for the demand side of the market

3.2.1. Corporates as the new investment opportunity

On the demand side, the introduction of the euro opened up some new investment opportunities especially for internationally operating institutional investors such as investments funds and insurance companies. Namely, the launch of the euro meant the abolition of legal investment restrictions for many institutional investors which were previously not allowed to invest in foreign currencies. In addition to such structurally higher demand other factors have also helped to make corporate bonds more attractive. One factor was that life insurance companies and pension funds switched from equities to bonds, leading to great demand for such securities.

Since the creation of the euro, bond markets investors have no longer been concerned by intra –euro exchange rate risks. As a result of a lower foreign exchange risk and an environment of low inflationary expectations, the credit risk has gained more importance in the pricing of financial instruments and the investment dicisions of investors. Moreover, the decline in yields in the market for the government bonds encouraged investment in more risky corporate bonds.

After the creation of the euro and the increase in the supply of the euro area bonds, on the demand side a geographical diversification increased strongly in euro area bond portfolios. While until 1998 bond distribution in

the euro area for the largest firms was almost exclusively domestic, the larger bond issues in 1999 were sold on the European scale. A typical example was the EUR 1 billion issue of the French telecom firm Alcatel, in February 1999, 28 per cent of which was placed with Italian and more than 20 per cent with German investors. In addition, the adoption of the euro was associated with a large increase in the asset share of internationally investing bond funds in Austria, Finland, France, and Germany. The euro area unweighted average of the share of assets invested in bonds funds with a Europe-wide strategy rose from 17 per cent in 1998 to 60 per cent in 2002. A similar shift occurred also in the investment policies of pension funds and life-insurance companies. (Pagano, Thadden 2004).

3.2.2. Liquidity in the corporate bond market

A study by Paul Harrison in 2001 stressed the importance of liquidity for the composition of the corporate bond market. If liquidity is restricted, investors emphasise the size and "familiarity" of issues, and so for the smaller and less prominent companies market access becomes difficult.

The expansion in the euro-denominated corporate bonds market has coincided with the other major trend in the bond market, namely the declining supply of treasure bonds. This development is a consequence of the consolidation of central government finances in the euro countries. In addition, at the same time, the introduction of the euro has led to increased competition. Previously, the governments were alone in their domestic markets. Today, they are doing battle for loans from the same source of financing. This competition has led to a number of changes to increase liquidity on the secondary market for treasury bonds. For instance, the average size of the issues has increased. The editions have also become increasingly standardised.

There is a key interrelation between the liquidity of a market and the existence of hedging opportunities. Without the possibility to hedge positions, the tendency to invest in this market remains subdued. The most commonly used instruments for the hedging of bond positions are bond futures. These are typically developed on the basis of government bonds. When these futures are used to hedge corporate bonds, major basis risks are incurred. In case of financial turmoil the prices of government and corporate bonds move in opposite directions. For this reason, the development of indices in non-government bonds and the introduction of futures and exchange-traded funds based on these indices may be a possible answer to these problems. Another possible solution to the liquidity problem could be to increase the issue size or to issue bonds fungible with previous bonds with a limited set of maturities. One of the main problems of the demand side

development is also the transparency of the private bond market, that can be improved by quotations on electronic trading systems (ECB 2004).

3.2.3. Development level of the secondary market

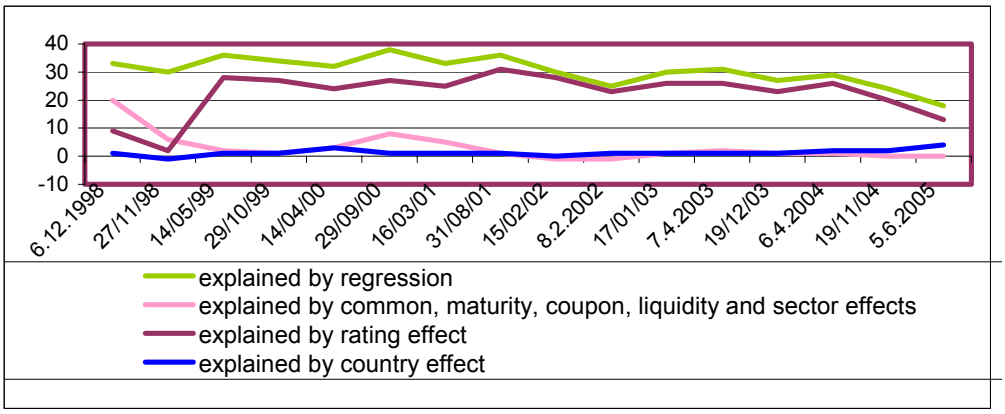
The secondary corporate bond market is fragmented. Most of this fragmentation is due to the fragmentation of clearing and settlements systems in Europe. Although the problem has been well known since the late 1990s, progress has been slow. Securities settlement in the euro area is still dominated by national players, whose number had only come down from 23 to 14 by 2003, compared to two in the USA, and hampered by national rules that restrict cross-border activities of settlement houses.

According to the study of Santos and Tsatsaronis (2003), the introduction of the euro reduced the cost of underwriting services for issuers in the single currency to levels similar to those prevailing in the US dollar – denominated segment of the market. The average gross fees in the euro-denominated segment of the bond market halved in the year the euro was introduced, dropping from 1.7 per cent in 1998 to 0.8 per cent in 1999, and remained at the average level of 0.6 per cent in the 1999-2001 period exactly the same figure as in the USD-denominated segment. It should be noted, that the reduction in underwriting fees was largerly due to a greater competition of the investment banks in the post-EMU European market and connected to the rapid penetration of the market by the US investment banks. The European corporate issuers moved away from their home bankers towards the larger US investment houses.

4. Integration of the European corporate bond market

The yield differential between corporate bonds depends on a number of factors, such as the credit rating, time-to-maturity and liquidity. Under full integration, the impact of these specific factors should be totally independent of the country of issuance. Using the same set of factors, it is possible to obtain measures of corporate bond market integration by investigating whether or not risk-adjusted the yield spreads have a systematic country component. In an integrated market, the proportion of the total yield spread variance that is explained by country effects should be close to zero. Following this approach the indicator shows that the euro area corporate bond market is fairly well integrated. Country effects are seen to explain only a very small proportion of the cross-sectional variance of corporate bond yield spreads (Figure 3).

Figure 3 Proportion of cross-sectional variance of corporate bond yield spreads, explained by various factors (percentages).



Source:ECB (2005c).

It should be conclude, that the bond-market integration does not require complete convergence of bond yields. Even in an integrated market, differentials may persist because they are a reflection of the various bonds' different risk, maturity, or cash-flow characteristics, rather than stemming from trading costs, taxes, clearing and settlements costs, or other institutional barriers to trade.

5. Conclusion

The euro area corporate bond market has grown considerably after the introduction of the euro. The evidence for the first 6 years of the euro suggests that the single currency has had a sizeable direct impact on bonds issued by non-financial corporations. Issuance of corporate bonds has taken off on an unprecendented scale in euro area. In this process, both investors and issuers have reaped the considerable benefits afforded by greater competition in the underwriting of private bonds and by the grater breadth and liquidity of secondary markets. The benefits have been very important for European companies, which have acquired cheaper access to a market. The single currency also appears to be a catalyst for restructuring the European corporate sector and for the emergence of new companies.

The euro area corporate bond market has not only remarkably grown in quantitative terms, but also its qualitative nature has changed. The euro area corporate bond market is nowadays characterised by large issues with all possible investment and speculative grade ratings from all types of economic sectors and typically low underwriting fees. As a consequence,

bond markets are gaining importance as means of obtaining corporate finance. The indicators for the corporate bond market, which has grown considerably since the adoption of the single currency suggests that this market is already fairly integrated in the sence that the country of issuance is only of marginal importance in explaining yield differentials.

Based on the findings in this paper it should be concluded, the following trends will play a major role in the improvement of the European corporate bond market in the future: convergence of structures towards the US style debt. This will lead to increased transparency; diversification of issues; growing debt issuance will attract more investors and will increase a competition. The challenge is to overcome the persistent fragmentation of clearing and settlement systems in the euro-area bond market, which prevents a full integration of the market for private sector bonds.

References

[1] BONDT G., MARQUES D., (2004), The HighYield Segment of the Corporate Bond Market: A Diffusion Modelling Approach for the United States, the United Kingdom and the Euro Area, European Central Bank, Working Paper Series No. 313, February, ISSN 1561-0810.

[2] Deutsche Bundesbank (2004), Recent Developments in The Corporate Bond market, Monthly Report April.

[3] ECB (2002), Report on Financial Structures, European Central Bank.

[4] ECB (2004), The Euro Bond Market Study, European Central Bank, December, ISBN 92-9181- 525-X.

[5] ECB (2005a), The Euro and European Financial Market Integration. Speech by Otmar Issuing, 31 May.

[6] ECB (2005b), Financial Stability Review, European Central Bank, June, ISSN 1830-2017.

[7] ECB (2005c), Indicators of Financial Integration in The Euro Area, European Central Bank, September.

[8] ECB(2005d), Euro Area Securities Issues Statistics.December 2004, Press Release, 18 February.

[9] European Commission (2003), Quarterly Bond Market Note, December.

[10] European Commission (2005), Quarterly Note on the Euro-Denominated Bond Markets,Directoriate–General Economic and Financial Affairs, No. 83, January-March, ECFIN/E/1(2005)REP52666.
[11] Financial Times (2005), Corporate Bond Issues Dry Up, February 4
[12] Financial Times (2005), Spanning the Transparency Divide, September 6.
[13] KPMG (2004), Debt Advisory Services. 2003 European Debt Market Review.
[14] LUENGNARUEMITCHAI P., ONG L., L. (2005), An Anatomy of Corporate Bond Markets: Growing Pains and Knowledge Gains, IMF Working Paper WP/05/152, July 2005.
[15] Moody's Investors Service (2002), Default & Recovery Rates of European Corporate Bond Issuers, 1985-2001, July.
[16] PAGANO M., THADDEN E. L, (2004), The European Bond Markets under EMU, Oxford Review of Economic Policy, 2004, Vol. 20, No. 4, pp. 531-554.
[17] PRATI A., SCHINASI G. J. (1997), What Impact Will EMU Have on European Securities Markets ? in: Finance and Development, IMF, September.
[18] RAJAN R., ZINGALES L. (2003), Bank and Markets: The Changing Character of European Finance in: V. GASPAR, P. HARTMANN, O. SLEIJPEN (eds), The Transformation of the European Financial System, European Central Bank, May, ISBN: 92-9181-348-6.
[19] SANTOS J.,A.,C., TSATSARONIS K.(2003), The Cost of Barriers to Entry: Evidence from the Market for Corporate Euro Bond Underwriting, BIS Working Papers No. 134, September 2003, ISSN: 1020-0959.
[20] Standard & Poor's (2005), Global Bond Markets' Weakest Links And Monthly Default Rates. Global Fixed Income Research, September .

EFFICIENT WAYS OF MONTE CARLO SIMULATION IN OPTION PRICING UNDER COMPLEX UNDERLYING PROCESSES [1]

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Abstract

In general, there are available many ways to detect the value of financial derivatives. Very useful approach is Monte Carlo simulation, mainly in case of complicated payoff functions or complex underlying processes. Unfortunately, the plain Monte Carlo simulation needs a very high number of independent paths to get reliable results. Fortunately, there exists many ways to decrease the number of paths via application of the variance reduction methods. In this paper we present some of theme. First, we generate (i) $\mathcal{N}[0;1]$ *and (ii)* $\mathcal{VG}\{\theta, \vartheta, \nu\}$ *random numbers. The second one was chosen as an example of a complex model which results in complicated applications. On the other hand it allows us to model the underlying distribution more reliably. Later we apply each of the methods to estimate the value of the European call option and barrier up-and-out call option within both settings – the Black and Scholes (1973) and the Variance gamma model (Madan* et al.*, 1998).*

Keywords: *option pricing, MC simulation, VG process, variance reduction method*

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1. Introduction

The essential condition of functional financial markets is the knowledge of methods to determine the prices of secondary financial assets (financial derivatives). It is regularly supposed that markets are efficient, prices of primary assets are given by the interaction of demand and supply, and there are no models to determine the price of primary assets more or at least such precisely as the market do.

However, the definition of a financial derivative says that its price is derived from the price of particular underlying asset. Therefore, there should exist some way to get the fair price of any financial derivative with respect to the price of the underlying asset. Simultaneously, this price must correspond with the market view. Otherwise the arbitrage opportunity will arise.

A very interesting type of financial derivatives is an option, since the payoff function is non-linear. It causes the risk resulting from short positions to be (almost) unlimited. It implies the requirement on efficient risk management of options. Of course, it also requires to know the ways to pricing and hedging.

By an option we generally mean a non-linear financial derivative that gives its owner (*long position*) the right to buy (*call options*) or the right to sell (*put options*) the underlying asset under predefined conditions. Simultaneously, the seller of the option has an obligation to meet the right of the owner (hence *the short position*). The predefined conditions concern, for example, the underlying amount of assets, the maturity time or the exercise price. Sometimes also other non-standard conditions are defined (average price, barrier level, etc.) and such options are referred to as exotic options.

Usually, there is a plenty of methods to price, and subsequently hedge, any option, to name some of them: solving of PDE (partial differential equation) or PIDE (partial integro-differential equations) if jumps occur, or applying the notion of martingales, the expectation operator with useful probability density functions to get analytical formula. It is naturale, that each method must lead to the same result, respecting the same inputs.

However, in some cases we can only run numerical procedures, such as binomial or multinomial lattice models, apply FDM (finite difference method), solve PDE and PIDE numerically or apply Monte Carlo simulation. For example, it is the case of options with complicated payoff functions, multifactor models or complex processes.

Some complex processes allow us to model higher moments of the distribution of asset returns. Although the non-normality of asset returns is

documented starting by Fama (1965), models incorporating skewness and kurtosis of asset returns were provided relatively recently, see e.g. Variance Gamma model (VG model) (Madan and Seneta (1990) for the symmetric case and Madan and Milne (1991) and Madan *et al*. (1998) for the assymetric case), Normal Inverse Gaussian (NIG) model (Barndorff-Nielsen (1995)) and its generalization Hyperbolic Model by Eberlein and Keller (1995), Meixner model introduced by Schoutens (2001) or CGMY model (according to Carr, Geman, Madan and Yor (2003)) which further generalized VG model. In this paper we will suppose the VG model which can be regarded as a Brownian motion subordinated by a gamma time or, alternatively, as a difference between two gamma processes.

The task of this paper is to present the application of Monte Carlo simulation in case of estimating the price of financial derivatives. We describe and apply several approaches aiming on improvement of plain Monte Carlo simulation.

All such methods are applied in order to: (i) generate random numbers from standard normal distribution; (ii) random numbers from variance gamma process; (iii) estimate the price of vanilla call under BS model; (iv) estimate the price of vanilla call under VG model; (v) estimate the price of barrier call under VG model.

The next section is devoted to basic stochastic processes. Subsequently we describe the Monte Carlo approach in option pricing. In this section we also provide the most important variance reduction techniques (the general ones). Finally, we proceed to running the simulation in order to price the vanilla call and the barrier call option.

2. Stochastic processes

In this section we briefly define all processes related to this paper. The simplest building blocks of almost all process applicable in modelling of asset prices are the Poisson process (or closely related ones as a gamma process) and the Wiener process, which provides ingredients for construction of almost all processes with diffusion part.

The Wiener process w_{dt} can be defined as $w_{dt} = \tilde{\varepsilon}_1 \cdot \sqrt{dt}$, where random number $\tilde{\varepsilon}_1$ belongs to the standard normal distribution, thus $\tilde{\varepsilon}_1 \in \mathcal{N}[0;1]$, and dt describes the (infinitesimal) time increment. Hence, the Wiener process is a martingale, its expected increment is zero at any time and the variance is closely related to the time change.

We can, besides others, build on the basis of Wiener process *the geometric Brownian motion* (GBM). It is the process which was supposed to be the one followed by stock prices in Black and Scholes (1973).[2] The typical property is the normal distribution of asset returns and logarithms of prices – which is equivalent to lognormal distribution of prices. Two key facts are that the financial assets gains return continuously and that their prices cannot be negative. Both ideas are supported by GBM, since the price is given by an exponential formula.

It is assumed that the price dynamic can be described by the following stochastic differential equation

$$dS = \mu \cdot S \cdot dt + \sigma \cdot S \cdot w_{dt}, \tag{1}$$

where dS is the price change over time interval dt, μ is the (continuous-time) expected return and σ is its volatility, both μ and σ are supposed to be deterministic constants. The solution to stochastic differential equation (1) is according to Itô's lemma:

$$S_{t+dt} = S_t \cdot \exp\left[\left(\mu - \tfrac{\sigma^2}{2}\right) \cdot dt + \sigma \cdot w_{dt}\right] \tag{2}$$

Note also, that in the risk neutral setting the preceding formulation changes by $\mu \to r$ to ensure that the asset gains riskless return r.

Since the volatility of asset returns is very difficult to measure and forecast, some slightly more realistic models suppose its stochastic feature. However, a candidate to model the volatility must respect the empirical fact that it regularly reverts back to its long run equilibrium. Besides others, it is the case of *Hull and White* (HW) *model* (1987). Hull and White supposed the volatility to put into (2) can be modelled by

$$d\sigma = a \cdot \sigma \cdot (b - \sigma) \cdot dt + s \cdot \sigma \cdot w_{dt}. \tag{3}$$

Here, a describes the tendency of mean-reversion, b is the long-run mean (equilibrium) and s is the volatility of the volatility. The Wiener process of HW (3) which drives the volatility is usually supposed to be independent to the one of the GBM (1).

2.1 Lévy models

Under a family of Lévy processes, in honour of Paul Lévy, are generally understood such processes that are of independent and stationary

[2] Although it is known at least starting from the Fama's work (1965), that the financial returns are not-normally distributed, the geometric Brownian motion has been the most commonly applied process to model asset prices and to price financial derivatives.

increments. These processes are also typical by the stochastic continuity – the probability of jump occurrence for given time t is zero. The Lévy process can be, besides others, decomposed into a diffusion part and a jump part. Clearly, not all parts must be present.

The modelling of financial prices is usually restricted to exponential Lévy models. The price dynamic is given by an exponential of a Lévy process $\mathcal{X}_t$ and some (deterministic) drift μ

$$\mathcal{S}_{t+dt} = \mathcal{S}_t \cdot \exp[\mu \cdot dt + \mathcal{X}_{dt} - \varpi \cdot dt]. \tag{4}$$

Moreover, we must deduce the term $\varpi = -\frac{1}{\nu} \cdot \ln\left(1 - \theta \cdot \nu - \frac{1}{2} \cdot \vartheta^2\right)$ to ensure that $\mathrm{E}[\mathcal{S}_{t+dt}] = \mathcal{S}_t \cdot e^{\mu \cdot dt}$. In fact, it is equivalent to deducing $\frac{1}{2} \cdot \sigma^2 \cdot dt$ in case of geometric Brownian motion. We can therefore interpret ϖ as a mean correcting parameter to the exponential of the Lévy process $\mathcal{X}_t$.

The classical works incorporating jumps in price returns were based on jump-diffusion models such as the Merton model (1976). These models were typical by a finite number of jumps in any time interval. However, the modern models of financial returns are of infinite activity – thus, the jumps, although small in scale, occur infinitely many times in any time interval. In fact these models do not need to be constructed of diffusion components, since the infinite activity allows us to describe the true feature (either jumps or skewness and kurtosis in the distribution of returns) well enough. In addition, the terminal price can be produced by simulation within one step.

Many Lévy models are regarded as subordinated Brownian motions. If $w(t)$ denotes a Wiener process in time t, we can define the subordinated Brownian motion $\mathcal{X}_t$ with drift μ and volatility σ by subordinating with another Lévy process $g(t)$ just replacing t by $g(t)$. Thus

$$\mathcal{X}_t = \mu \cdot g(t) + \sigma \cdot w(g(t)) \tag{5}$$

Hence, the subordinated process $\mathcal{X}_t(g(t);\mu,\sigma)$ is driven by another process $g(t)$ which is referred to as the subordinator. In such case we need to imagine "an internal time" given by process $g(t)$. Of course, the process still evolves in time t. However, so called internal time give us very nice economic interpretation of subordinated processes – the (geometric) Brownian motion given in a random business time, which is stipulated by the

economic activity, the mass of information etc.[3] In other words, "the time increments" are not constant but stochastic. This feature allows us to model also other parameters of the distribution.

The very popular subordinators are *the Gamma process* resulting into *Variance gamma model* (the name is since the variance of the primary component is not given by the classical time but by the "gamma-time") and the *Inverse Gaussian process* which results into *Normal Inverse Gaussian model* (see e.g. Barndorff-Nielsen, 1995).

In this paper we apply the Variance gamma (VG) model[4] (for more details see e.g. Madan and Seneta (1990), Madan and Milne (1991) or Madan *et al.* (1998)). Consider the VG process $\mathcal{VG}(g(t;\nu);\theta,\vartheta)$, where $g(t;\nu)$ is the (random, but strictly increasing) gamma time from gamma distribution $G[1;\nu]$, (here ν describes its variance and allows us to control the kurtosis), θ is the drift (by which we can control the symmetry), and ϑ describes the volatility. Hence the asset price dynamics can be expressed as[5]

$$\mathcal{S}_{t+dt} = \mathcal{S}_t \cdot \exp[\mu \cdot t + \mathcal{VG}_t - \varpi \cdot dt] = \mathcal{S}_t \cdot \exp[\mu \cdot t + \theta \cdot g_t + \vartheta \cdot w(g_t) - \varpi \cdot dt]. \quad (6)$$

One step further is to incorporate the notion of stochastic environment into Lévy models. Although many Lévy models allow fitting well the empirical structure of returns including skewness and kurtosis, the calibrated parameters in general do not stay the same over time. Besides the stochastic volatility approach of Hull and White (1987) or Heston (1993), it can be done either by applying of Lévy-driven Ornstein-Uhlenbeck processes to model volatility (this direction was developed mainly by Barndorff-Nielsen and Shephard) or time changed Lévy processes (which was suggested by Carr *et al*., 2003). A brief review of all approaches is provided e.g. by Cont and Tankov (2004) or Schoutens (2003).

Here, we proceed according to the approach of Carr *et al*. (2003), in which it is according to Brownian scaling property supposed that the change in volatility can be captured by the (random) change in time. Thus, although the VG model is given by time changed Brownian motion (by gamma time), it is further extended by introducing a stochastic time $Y(t)$ given by mean-reverting CIR square-root process (Cox, Ingersoll and Ross, 1985):

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[3] For example, if the economic activity is above average, the internal time grows rapidly comparing with the classical time. And vice versa.

[4] VG model can be alternatively defined as a difference between two increasing gamma processes, one for positive increments in the price, the other for negative ones.

[5] Note, that this is the true (statistical) evolution of the price. However, to price a financial derivative we need to change the drift to be risk-neutral and, probably, also change other parameters of the VG process.

$$dy = \kappa \cdot (\eta - y) \cdot dt + \lambda \cdot \sqrt{y} \cdot w_{dt} \tag{7}$$

with long run time change η, the rate of mean reversion κ and time volatility λ.[6] Thus, the $\mathcal{VG}(g(t;\nu);\theta,\vartheta)$ model can be reformulated into $\mathcal{VG}(g(y(t;\kappa,\lambda);\nu);\theta,\vartheta)$. Note, that (7) describes the dynamics of the *time rate y* – the change of $\mathcal{Y}$-time over the interval dt. Thus, $y_{t+dt} = y_t + dy$ and the alternate time describing the stochastic environment is given by

$$\mathcal{Y}_t = \int_0^t y_u \mathrm{d}u. \tag{8}$$

As before to get the asset price dynamic in either true or risk-neutral setting, we must incorporate the mean correcting parameter. For example, in the risk-neutral setting we need to get $\mathrm{E}[\mathcal{S}_{t+dt}] = \mathcal{S}_t \cdot e^{r \cdot dt}$. And therefore

$$\mathcal{S}_{t+dt} = \mathcal{S}_t \frac{\exp[r \cdot dt + \mathcal{VG}(\mathcal{Y}(dt))]}{\mathcal{E}[\exp[\mathcal{VG}(\mathcal{Y}(dt))]]}. \tag{9}$$

2.2 Option pricing within Lévy models

Lévy models must be usually regarded as incomplete ones. Standard Black and Scholes arguments (replication with the underlying) cannot be used since there are more sources of risk. Alternative risk-neutral approach is also problematic since there do not exist unique martingale probability which is equivalent to the original space of true market probabilities. The pricing problem can be solved by incorporating of mean correcting parameter, introducing of characteristics functions or applying of suitable transform techniques. Some interesting questions of martingale measures of Lévy processes are examined e.g. by Fujiwara and Miyahara (2003).

For illustrative reasons, we will now state the European call option pricing formula within VG model $\mathcal{V}^{\mathcal{VG}}(\mathcal{S},\vartheta;\tau)$, which is probably the only one available in the "user-friendly" expression:

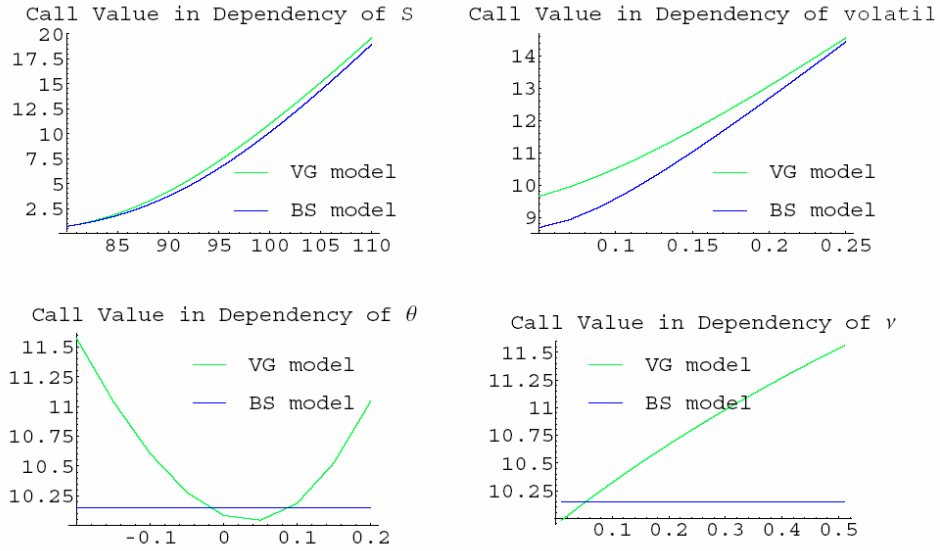
$$\mathcal{V}^{\mathcal{VG}}(\mathcal{S},\vartheta;\tau) = \int_0^\infty g(t)\mathcal{V}^{\mathcal{BS}}\left(\mathcal{S} \cdot \exp\left(\theta g + \tfrac{1}{2}\vartheta^2 g - \omega\tau\right), \vartheta\sqrt{\tfrac{g}{\tau}};\tau\right)\mathrm{d}g. \tag{10}$$

As before, $\mathcal{S}$ is the underlying asset price, ϑ is the volatility, θ is the drift, τ is the time to maturity, ω is the mean correcting parameter, $\mathcal{V}^{\mathcal{BS}}(\cdot)$ is the Black and Scholes pricing formula and $g(t)$ denotes the probability density function of the gamma distribution.

[6] The CIR model should lead to positive values only if $2 \cdot \kappa \cdot \eta \geq \lambda^2$.

Following Figure 1 illustrates the effect of particular parameters to the VG model on the vanilla option price ($\mathcal{S} = 100$, $\mathcal{K} = 101$, $\tau = 1$, $\theta = 0.1436$, $\vartheta = 0.12136$, $\nu = 0.3$). Clearly, there is no significant difference to BS model considering various levels of $\mathcal{S}$. The effect of volatility is much more considerable. Finally, we can see how θ and ν, not included into the BS model, influence the option price within VG model.

Figure 1 – The effect of VG process parameters on vanilla call option price



3. Monte Carlo simulation in option pricing

The application of Monte Carlo simulation in pricing of options was firstly analyzed by Boyle (1977) and complexly treated in Boyle *et al.* (1997). Suppose first a European plain vanilla call. The word "European" means that the option can be exercised just at the maturity time. "Plain vanilla call" indicates that the payoff function is following:

$$\Psi_{\mathcal{T}} = (\mathcal{S}_{\mathcal{T}} - \mathcal{K})^{+} \equiv \max(\mathcal{S}_{\mathcal{T}} - \mathcal{K}; 0). \qquad (11)$$

Here, $\mathcal{T}$ denotes the maturity time, $\mathcal{S}_{\mathcal{T}}$ is the price of the underlying asset at maturity, and $\mathcal{K}$ is the exercise price. Depict the value of an option f, whose payoff function $\Psi_{\mathcal{T}}$ is defined by equation (11), at time t by $\mathcal{V}_t$. Now, define

the set of risk-neutral (martingale) probabilities Q – such probabilities of future states under which the (risky) stochastic process $\mathcal{S}(t)$ behave as it would be martingale. Hence, if

$$\dot{\mathcal{S}}(t) = \mathcal{S}(t) \cdot e^{-r(t)} \tag{12}$$

we get

$$\mathbb{E}_0^Q\left[\dot{\mathcal{S}}_t\right] = \dot{\mathcal{S}}_0 \quad \forall t \geq 0. \tag{13}$$

In this case, we can define the value of an option f as its payoff expected at maturity and discounted at the riskless rate r up to the beginning:

$$\mathcal{V}_t = e^{-r\cdot\tau} \cdot \mathbb{E}_0^Q[\Psi_{\mathcal{T}}], \tag{14}$$

where $\tau = \mathcal{T} - t$.

Suppose also that ω depicts future states of the world, Ω is the set of all such states, $\omega \in \Omega$, and the option payoff at maturity is uniquely determined by ω, $\Psi_{\mathcal{T}}(\omega)$. Thus, we can rewrite (4) in more details as follows

$$\mathcal{V}_t = e^{-r\cdot\tau} \cdot \mathbb{E}_0^Q[\Psi_{\mathcal{T}}(\omega)] = e^{-r\cdot\tau} \cdot \int \Psi_{\mathcal{T}}(\omega)\mathrm{d}Q. \tag{15}$$

Hence, due to (15) it is clear that to get an estimate of the option value $\hat{\mathcal{V}}_t$ it is sufficient to generate (simulate) enough relevant future states ω. Note, that relevant states are all states which can affect the option payoff – the future evolution of stock prices, interest rates, volatility, dividend yields, foreign exchange rates, etc. However, if we study the plain vanilla European call option – the only relevant state is the underlying asset price at the maturity time, $\omega^{(n)} \cong \mathcal{S}_{\mathcal{T}}^{(n)}$.

Denote by N the number of generated future states ω – or random scenarios of the underlying asset price evolution. Then it holds that

$$\mathcal{V}_t \approx \hat{\mathcal{V}}_t = e^{-r\cdot\tau} \cdot \frac{1}{N}\sum_{n=1}^{N} \Psi_{\mathcal{T}}^{(Q)}\left(\omega^{(n)}\right). \tag{16}$$

Obviously, in order to get an estimate of the price we first determine the option payoff for each relevant (risk neutral) state ω (price of the underlying asset at the maturity time $\mathcal{S}_{\mathcal{T}}$. Subsequently, we have to calculate an average payoff and discount its value to the beginning. Note, that to get reliable estimate we must realize sufficiently high number of different future paths.

Suppose once again, that the underlying asset price follows geometric Brownian motion given by equation (1). Clearly, if we want to realize a random evolution of an asset $\mathcal{S}$ in order to price an option, we must change

its statistical (risky) drift μ into the risk neutral one – the riskless rate r. Moreover, we are interested only in the price at time $\mathcal{T}$. Hence, an n-th risk neutral estimate of the future price is

$$\mathcal{S}_{\mathcal{T}}^{(n)} = \mathcal{S}_t \cdot \exp\left(\Delta \mathcal{S}_{\tau}^{(n)}\right) = \mathcal{S}_t \cdot \exp\left[\left(r - \tfrac{\sigma^2}{2}\right) \cdot \tau + \sigma \cdot \widetilde{\varepsilon}^{(n)} \cdot \sqrt{\tau}\right], \quad n = 1, \ldots, N. \quad (17)$$

From (17) it is evident that the only source of uncertainty is $\widetilde{\varepsilon}$. Therefore, the optimal N is such which ensure target probability distribution (unit variance and zero mean, skewness and excess kurtosis) of the random element with minimal time cost.

The second model on which we concern here more particularly is the Variance gamma process. The model is determined by three parameters. It can be defined either as a subordinated Brownian motion $\mathcal{VG}(g(t;\nu);\theta,\vartheta)$ or as a difference between two gamma processes. In both cases it consists of two independent processes which results into requirements of efficient simulation techniques.

3.1 Variance reduction methods

In this subsection we describe few techniques required to increase the efficiency of option pricing. In order to get reliable estimate of the price we should realize huge number of (independent) paths – usually we need N at least 100 000. Although it can be very time consuming to produce such huge number of paths, the result still need not be reliable. It is the reason why efficient improvements to plain Monte Carlo simulation (PMC) are still developed. These techniques are commonly referred to as *variance reduction techniques*, since applying them we aim on reduction of the variance (error term).

Brief review of most important methods is included for example in Charnes (2000) or Hull (2002). More complete and rigorous treatment with many applications is provided by Boyle *et al.* (1997) and Glasserman (2004).

The simplest technique, both from the theoretical and application point of view, is commonly called the *Antithetic variate method* (AVM, AMC). The method was firstly applied in option pricing by Boyle (1977). The key idea is, that if $\widetilde{\varepsilon} \in \mathcal{N}[0;1]$ then the same must be true also for $-\widetilde{\varepsilon} \in \mathcal{N}[0;1]$. The perfectly negative correlation of these two samples substantially reduces the error in estimating the price.

The improvement is presented in two aspects. First, if we set the target number of independent paths to be N then we have to generate only $M = N/2$ paths. Hence, applying the method we can significantly decrease the

time cost. Second, since $(\tilde{\varepsilon}_m - \tilde{\varepsilon}_m)/2 = 0$, the method will also have positive effect on all symmetry measures (mean, skewness), whose values will be exactly as we need. The shortcoming of this approach is that it can be applied primarily for symmetric distributions.

The *Moment matching method* (MM), which aims on matching the selected moment of the underlying distribution, can be regarded as an alternative. Of course, an inevitable condition is to know the right value to be matched. Basic applications of this method ere presented e.g. by Barraquand (1995), Boyle *et al.* (1997) and Duan and Simonato (1998). Very similar is the *Control variate method* (CVM), see Boyle (1977). However, the application aims more on particular problems, such as pricing of geometric Asian options by virtue of arithmetic solutions, see Kemma and Vorst (1990).

More sophisticated method is the *Stratified sampling* (SS, SMC). In general, there exist two approaches to SS. The first way is direct. It consists of stratifying the interval of admissible values into equiprobable strata, that is with equal probabilities. Suppose random number from standard normal distribution: $\tilde{\varepsilon} \in \mathcal{N}[0;1]$. Therefore, the interval of admissible values is $\tilde{\varepsilon} \in (-\infty;+\infty)$. The next step is to divide this interval into *M* subintervals in such a way that

$$\Pr\{\tilde{\varepsilon} \in (\varepsilon_m ; \varepsilon_{m+1}]\} = p_m, \;\; p_m = \frac{1}{M}, \quad m = 1,\ldots M, \tag{18}$$

and for example

$$\varepsilon_1 = -\infty, \quad \varepsilon_{M+1} \to +\infty.$$

Subsequently, we need to generate *M* random numbers uniformly distributed between zero and one: $\tilde{\mathcal{U}} \in \mathcal{R}[0;1]$. Finally, we can generate random numbers from target distribution as follows:

$$\tilde{\varepsilon} = \varepsilon_m + \tilde{\mathcal{U}} \cdot (\varepsilon_{m+1} - \varepsilon_m). \tag{19}$$

Clearly, if $M = N$, then we take just one number from each equiprobable interval. Similarly, if $M = N/5$ we have to generate five random values from each interval.

However, sometimes it is difficult to handle with plus or minus infinity. In this case, we can prefer indirect stratification. Applying this procedure, we generate (stratify) 'probabilities', first. Hence, we stratify the unit interval into *M* subintervals of equal length. Next we produce uniformly distributed random numbers from these subintervals:

$$\tilde{u}_m = \frac{m-1}{M} + \frac{\tilde{\mathcal{U}}}{M}. \tag{20}$$

Finally, we transform each $\tilde{u}$ into its related value of the target distribution by inverse transform. For example, considering normal distribution:

$$\mathcal{N}^{-1}(\tilde{u}_m).$$

Another very interesting approach, which extends the application of SMC also for more dimensions, is *Latin hypercube sampling* (LHS). This approach was firstly introduced by McKay *et al.* (1979) and later analyzed by Stein (1987).

Suppose that we need to generate two-dimensional random processes. An obvious way for one dimension would be stratified sampling. However, here we need to get two independent coordinates for each random state. Hence, we cannot stratify the interval since results obtained in this way were not strictly independent.

Fortunately, the solution is easy. We can put randomly the subintervals of both dimensions together. Suppose that $M = N = 10$ and denote the coordinates by $\{x, y\}$. The first step is to stratify the unit interval into ten equiprobable subintervals. Next we randomly permutate these subintervals. Subsequently, we can generate both coordinates for each N applying the indirect SS method. That is, we first get values of the inverse distribution function for both coordinates, where x is based on the origin subintervals and y on theirs permutation, and finally we transform them into target two-dimensional random numbers. For example, for $n = 1$ we get $x \in [0,0.1)$ and $y \in [0.3,0.4)$ and therefore $\{x, y\} \in \{0.043,0.314\}$. Figure 2 illustrates location of all coordinates within stratified subintervals.

It is clear that the method of stratified sampling (as well as its LHS extension) can be used only to price plain vanilla options with European payoff – since here only the price of the underlying asset at the maturity play role.

Figure 3 illustrates this effect. We present three distinct paths of asset price evolution (vertical axe) in time (horizontal axe). The initial price is 100. The method of stratification allows us to get directly the price at the terminal time, $\mathcal{T} = 25$. However, if we want to price some option whose payoff depends on the historical path (e.g. barrier

option) we must create other extension – *the bridge sampling* – since we need to recover the intermediate prices.

Figure 2 - The technique of Latin Hypercube Sampling for two dimensions

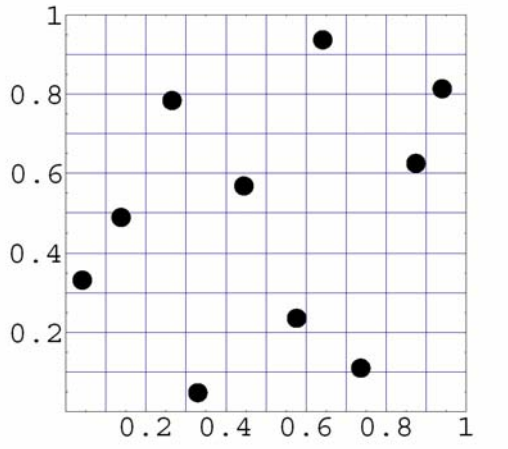
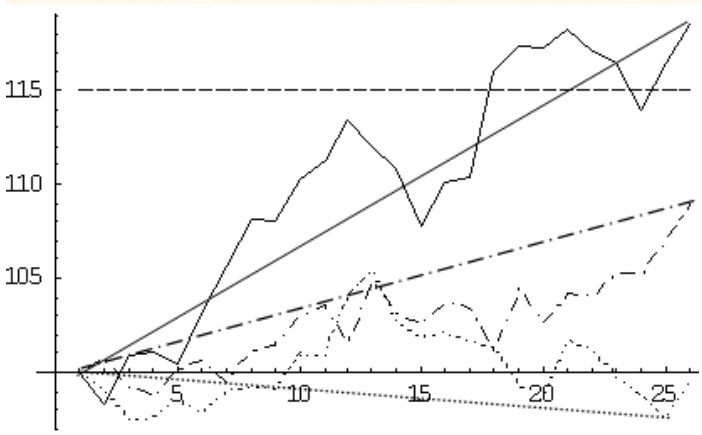
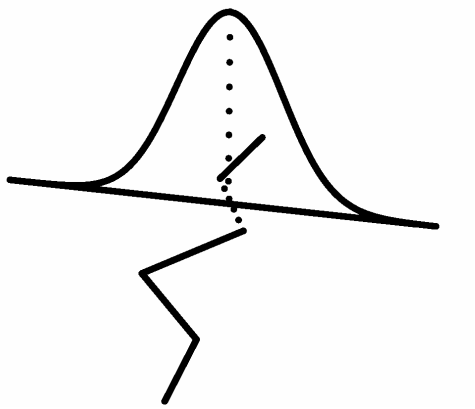


Figure 3 – Stratifying the terminal price



Thus, the technique of bridge sampling allows us to model whole part of the price trajectory via stratification. Knowing the value at time zero and the value at final time we can easy apply the bridge sampling to generate the value also for any intermediate time (depending on the conditional distribution), see Figure 4 for the case of Wiener process.

Figure 4 – Wiener bridge sample



The thin black line illustrates the random evolution of the process in discrete time. We know the endpoints. Denote the midpoint in time as t. Then we denote the endpoint values as $w(t-\Delta t)$ and $w(t+\Delta t)$. Although the unconditional distribution of $w(t)$ is $\mathcal{N}(0;\ 1)$, the conditional mean, for example, is given by linear interpolating of $w(t-\Delta t)$ and $w(t+\Delta t)$. Hence, the intermediate value can be recovered by

$$w(t)=\frac{w(t+\Delta t)+w(t-\Delta t)}{2}+\sqrt{\frac{\Delta t}{2}}\cdot\widetilde{\varepsilon}, \tag{21}$$

Very similar is the application of bridge sampling in the VG model, see e.g. Ribeiro and Webber (2003) for VG bridge or Avramidis *et al*. (2003) for double gamma bridge. Conditional VG-random numbers can be obtained by incorporating of related *Beta distribution*, $\widetilde{\beta}\in \mathcal{B}eta(\frac{\Delta t}{\nu};\frac{\Delta t}{\nu})$. Thus

$$\begin{aligned}\mathcal{VG}(t)&=\theta g_t+\vartheta\sqrt{g_t}\,\varepsilon\\&=\widetilde{\beta}[\mathcal{VG}(t+\Delta t)-\mathcal{VG}(t-\Delta t)]+\mathcal{VG}(t-\Delta t)+\vartheta\sqrt{\widetilde{\beta}[g(t+\Delta t)-g(t)]}\widetilde{\varepsilon},\end{aligned} \tag{22}$$

where $g(t)$ can be stratified in this way:

$$g(t)=\widetilde{\beta}[g(t+\Delta t)-g(t-\Delta t)]+g(t-\Delta t). \tag{23}$$

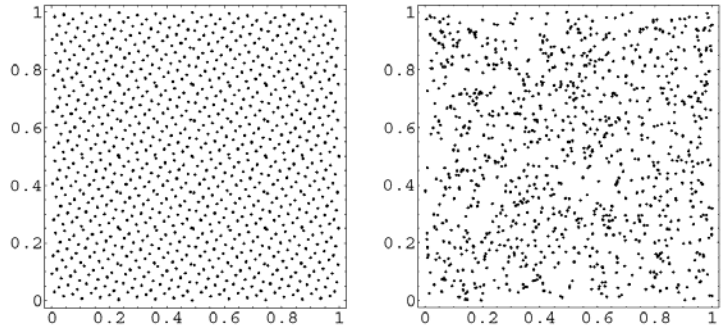
The double gamma bridge can be implemented on the basis similar to (23), since in this

case, the VG process is interpreted as a difference of two increasing (and independent)

gamma process, $\mathcal{G}_u$ - $\mathcal{G}_d$.

All methods described above can be regarded as special cases of Monte Carlo simulation. However, it is not the case of the Quasi Monte Carlo simulation. While applying Monte Carlo simulation we primary need to generate pseudorandom numbers uniformly distributed on the unit interval and fulfilling prespecified tests of randomness, applying Quasi Monte Carlo simulation we proceed according to the chosen algorithm and generate quasirandom numbers in deterministic rather than random sequence. The review of basic approaches has been provided e.g. by Niederreiter (1992) or Glasserman (2004). Figure 2 shows the difference between pseudorandom and quasirandom numbers in two-dimensional cube for N =1000. In order to produce quasirandom numbers we have proceed according to Woźniakowski (1991).

Figure 5 – Comparison of quasirandom numbers and pseudorandom



4. Numerical study

In this chapter we compare chosen approaches of Monte Carlo simulation. First, we will aim on two types of probability distribution – $\mathcal{N}[0;1]$ and $\mathcal{VG}(g(t;\nu);\theta,\vartheta)$. Next, we apply these methods in order to obtain the price of (i) plain vanilla call option and (ii) up-and-out call option.

All computation is done in Mathematica® software (version 5.1) on 512 MB PC with Pentium 4 3.2 GHz HT processor. If not stated otherwise, all cases are studied for five different numbers of random (and "independent") paths – more particularly N = 100, 1 000, 10 000, 100 000 and 1 000 000.

4.1 Generating random numbers

The first step to analyze the efficiency of particular approaches to Monte Carlo simulation is to generate random numbers from selected probability distribution and subsequently examine whether their actual

characteristics are close to target values. More particularly, we will evaluate mean, variance, skewness, kurtosis, and time costs.

The selected probability distributions are standard normal distribution, specified by $\mathcal{N}[0;1]$, and variance gamma distribution – the case of parametric one, specified by $\mathcal{VG}(g(t;\nu);\theta,\vartheta)$.

First we summarize some results of random numbers generated from standard normal distribution. Target values are zero mean, unit variance, zero skewness and zero excess kurtosis.

With plain Monte Carlo (PMC) we are able to be close to these target values only with huge N. Significant improvement can be done by incorporating of antithetic variates technique (AVM). Clearly, if the method is applied in right manner, we must get target values of mean and skewness, although the number of paths N is low. Relevant time costs are approximately one half of time needed to execute PMC. Note, that e.g. N = 10 indicates $N/2$ of independent paths.

Next, we have evaluated stratification method (SS). In other words, we have stratified the interval of admissible values in order to get smoother curve of implied probability distribution even for low N. There is no surprise, that our expectations are fulfilled. However, respecting total time costs, there is no clear improvement against AVM. All observed results are included in Table 1.

Table 1 Characteristics of random numbers from $N[0;1]$ for particular methods

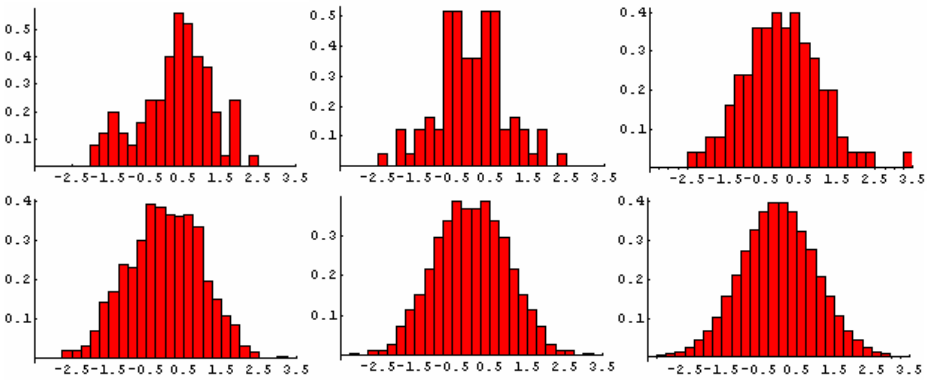
A	Random numbers from □[0;1] – PMC					
Number of scenarios	**Mean value**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**	**CPU (seconds)**
100	0.2954	0.9555	0.9130	-0.4117	2.7803	0.0000
1 000	-0.0049	0.9820	0.9643	-0.0177	2.8005	0.0310
10 000	-0.0038	1.0091	1.0183	0.0382	3.0018	0.0930
100 000	-0.0045	0.9998	0.9995	0.0094	3.0093	1.0470
1 000 000	0.0007	1.0001	1.0002	0.0012	3.0013	9.6720

B	Random numbers from □[0;1] – AVM					
Number of scenarios	**Mean value**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**	**CPU (seconds)**
100	0.0000	0.9047	0.8185	0.0000	3.2804	0.0000
1 000	0.0000	0.9738	0.9482	0.0000	3.0468	0.0160
10 000	0.0000	1.0036	1.0071	0.0000	2.9772	0.0620
100 000	0.0000	0.9996	0.9993	0.0000	3.0097	0.3910
1 000 000	0.0000	1.0000	0.9999	0.0000	3.0032	4.1250

C	Random numbers from □[0;1] – SS					
Number of scenarios	**Mean value**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**	**CPU (seconds)**
100	0.0120	1.0194	1.0392	0.2317	3.3918	0.1090
1 000	0.0010	1.0023	1.0046	0.0374	3.0942	0.3280
10 000	0.0000	0.9999	0.9998	0.0006	2.9932	3.0940
100 000	0.0000	1.0000	1.0000	0.0001	2.9992	31.7180
1 000 000	0.0000	1.0000	1.0000	0.0000	2.9998	322.8440

Furthermore, we include graphical presentation of some results – histograms of implied distribution for N = 100 and N =1 000. There is no surprise, that results of PMC are very plain. Histograms of AVM exactly indicate the improvement of the method – it provides us with a distribution which is symmetric around mean. However, the histogram of SS indicates more smooth distribution, mainly around the mean and in tails.

Figure 6 Histograms of random number from $\mathcal{N}[0;1]$ PMC (left), AVM (middle) a SS MC (right)



Last applied approach was simulation based on quasi random numbers (QMC) which give us similar results as SS MC for comparable N, but the time costs are significantly lower.

We have also tried to examine the results for the sum of two independent random numbers from $\mathcal{N}[0;1]$. Here, AVM does not provide clear improvement. Thus, the only possibility, how to get more reliable results is to apply Latin hypercube sampling (LHS). The results of LHS are better for the same N. However, if we compare these two methods for approximately same time costs, there is apparent only slight improvement. Of course, the convergence of LHS is better.

Table 2 Characteristics of random numbers from $\mathcal{VG}$((1;0.3);-0.14;0.12) for particular methods

A	Random numbers from □□((1;0.3);-0.14;0.12) – PMC					
Number of scenarios	**Mean value**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**	**CPU (seconds)**
100	-0.1023	0.1289	0.0166	-0.9190	4.1671	0.0150
1 000	-0.1424	0.1412	0.0199	-0.7940	3.8087	0.0470
10 000	-0.1435	0.1452	0.0211	-0.7590	4.2174	0.5160
100 000	-0.1441	0.1448	0.0210	-0.8063	4.3376	4.8440
1 000 000	-0.1435	0.1446	0.0209	-0.8095	4.3738	48.4060

B	Random numbers from □□((1;0.3);-0.14;0.12) – AVM					
Number of scenarios	**Mean value**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**	**CPU (seconds)**
100	-0.1213	0.1330	0.0177	-0.1450	3.7442	0.1560
1 000	-0.1472	0.1487	0.0221	-0.8926	4.4165	0.0780
10 000	-0.1444	0.1458	0.0212	-0.7640	4.1759	0.5630
100 000	-0.1433	0.1441	0.0208	-0.7876	4.3085	5.6870
1 000 000	-0.1435	0.1445	0.0209	-0.8036	4.3570	57.1570

E	Random numbers from □□((1;0.3);-0.14;0.12) – LHS					
Number of scenarios	**Mean value**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**	**CPU (seconds)**
100	-0.1423	0.1458	0.0213	-0.4828	4.0969	0.2340
1 000	-0.1443	0.1460	0.0213	-0.7755	4.3094	2.0470
10 000	-0.1437	0.1453	0.0211	-0.7843	4.1595	19.8280
100 000	-0.1436	0.1446	0.0209	-0.8214	4.4640	196.7660
1 000 000	-0.1436	0.1447	0.0209	-0.8046	4.3391	2197.5900

F	Random numbers from □□((1;0.3);-0.14;0.12) – QMC (LHS)					
Number of scenarios	**Mean value**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**	**CPU (seconds)**
100	-0.1385	0.1323	0.0175	-0.9017	4.2937	0.2500
1 000	-0.1428	0.1430	0.0204	-0.7587	4.0679	2.2500
10 000	-0.1437	0.1454	0.0212	-0.8422	4.5940	20.4060
100 000	-0.1436	0.1444	0.0209	-0.8039	4.3717	255.1720
1 000 000	-0.1436	0.1445	0.0209	-0.8055	4.3619	2321.7200

The next step is to examine the efficiency of these approaches to Monte Carlo simulation in case of generating the complex Variance gamma process regarded as a combination of two independent random numbers – from standard normal distribution and from gamma distribution.

Here, we suppose following parameters $\theta = -0.1436$, $\vartheta = 0.12136$, $\nu = 0.3$, and τ. is one year, which imply *mean* = -0.1436, *standard deviation* = 0.1446, *skewness* = 0.8055, *kurtosis* = 4.1424.

In this case the results are summarized in Table 2. Since the problem is formulated as a generation of two independent processes, one of which is not symmetric, there is almost no effect of AVM, see Part B of the table.

Part E and F provided results obtained by LHS method either based on pseudorandom or quasi random numbers. Here, the method using quasirandom numbers takes about 10% much more time, while the results can be regarded as slightly better (except for low N).

As before, if we are interested only in approximate results and respecting the time costs, it is suitable to apply simple method (PMC). However, if we need exact results, LHS should be applied.

4.2 Vanilla call option valuation

Suppose a call option f with following parameters: r = 0.1; τ = 1, $\mathcal{S}_0 = 100$, $\mathcal{K} = 101$. We suppose two types of underlying distribution: GBM (σ = 21%) and VG (parameters as before). Results are included in Table 3: GBM/BS model (Black and Scholes, 1973) in Part A and VG model (Madan *et al.* 1998) in Part B.

As it is apparent from Part A, PMC is relatively far from theoretically true result even for huge N. AV MC does slightly better. Note, that there is almost no time improvement (time costs for generating random numbers are only a fraction of total time costs).

If we compare SS with PMC, we see that it provides very good results as early as N = 1 000. Relating time costs are very low, so that there is no reason to apply simple methods (PMC, AV MC). Moreover, SS MC beats also QMC, although time costs of SS are approximately twice as much as of QMC for the same N.

Proceed now to the Part B. We can see that the complexness of the VG model plays big role. Although the simple methods (PMC, AV MC) can provide good result, the convergence is low and the error of estimated result is significant.

Table 3 Approximating the value of plain vanilla call by simulation

A	Plain vanilla call in BS setting (*GBM*)						true price = 13.0295	
method	**PMC**		**AV MC**		**SS**		**QMC**	
N	**value**	**time (seconds)**	**value**	**time (seconds)**	**value**	**time (seconds)**	**value**	**time (seconds)**
100	17.7456	0.0000	11.8243	0.0000	12.9683	0.0780	13.0268	0.0160
1 000	12.8686	0.0310	12.7975	0.0160	13.0265	0.3590	13.0766	0.0780
10 000	13.0780	0.1560	13.0897	0.1250	13.0312	3.3440	13.0382	1.1560
100 000	12.9633	1.3910	13.0267	1.0150	13.0295	32.4530	13.0305	13.7820
1 000	13.0419	13.6090	13.0303	10.2190	13.0295	345.1410	13.0296	164.2960

B	Plain vanilla call in VG setting (*Variance gamma process*)						true price = 10.9815	
method	**PMC**		**AV MC**		**LHS**		**QMC (LHS)**	
N	**value**	**time (seconds)**	**value**	**time (seconds)**	**value**	**time (seconds)**	**value**	**time (seconds)**
100	13.9800	0.0320	11.3148	0.0630	10.9701	0.3750	10.6830	0.2030
1 000	11.0006	0.0930	10.9513	0.0930	10.9302	2.1400	10.9353	2.0310
10 000	11.0352	0.5940	11.0041	0.6410	11.0210	24.0310	10.9800	21.9060
100 000	10.9509	5.8750	10.9800	5.8900	10.9751	198.3130	10.9986	211.4220
1 000	10.9845	57.9060	10.9762	58.7660	10.9840	1994.3600	10.9801	2249.1600

Thus, even if LHS based either on pseudorandom numbers or quasirandom numbers does not provide us with exactly the same value as the theoretically true price is (and time costs are huge), its error is acceptable. Notice, that LHS using quasirandom numbers gives us again slightly more interesting results (once again, except low number of scenarios).

Finally, we provide also some convergence results, see Appendix I for BS setting (PMC, AV MC and SS MC). When building the chart, we start with $N = 5\,000$ and proceed up to $N = 500\,000$, the step is 500.

We can see that according the scenarios we have run the convergence of PMC is very pure. Although it can happen that the simulation will provide right number, we cannot be sure of that. By contrast, AV MC is very close to the line indicating the true price starting at $N = 100\,000$. Unfortunately, even if we increase the number of scenarios far behind $N = 1\,000\,000$, the estimated price will probably not be equal to the true value.

More importantly, the convergence of SS MC starts to be very good for $N = 10\,000$ and with $N = 150\,000$ there are almost no errors in price estimate. Thus, the improvement is clearly visible.

4.2 Up-and-out call option valuation

Suppose a call option f with barrier $\mathcal{U}$ set initially above the price of an underlying asset $\mathcal{S}$ at time zero, $\mathcal{S}_0 = 100,\ \mathcal{U} = 125.$ Other parameters are the same as before. For simplicity, we will suppose, that the price is monitored 16 times per option life (the intervals are of equal length).

Now, we will study only results for VG model executed with LHS

method.[7] Thus, as a first step we generate the terminal price of the underlying asset. Next we calculate the vanilla option payoff. At this moment, we can make a test – if the payoff is zero, also the payoff of barrier options must be zero and it is not useful to recover intermediate prices; if the terminal price is above the barrier, we know, that up-and-out option cannot be exercised and once again, there is no need to know intermediate prices; otherwise we must recover intermediate prices applying bridge sampling.

Results are apparent from Table 4. Since we monitor the underlying asset price at discrete times, we are not able to provide any theoretically true value. We can see that both approaches give us for higher N approximately same (and stable) results.

Table 4 Approximating the values of call options under VG model

B	Plain vanilla call in VG setting (*Variance gamma process*)				True prices = {10.9815, ?, ?}		
method	**LHS MC**				**QMC (LHS)**		
N	**vanilla value**	**up-and-in value**	**up-and-out value**	**time (seconds)**	**vanilla value**	**up-and-out value**	**time (seconds)**
100	10.8154	4.8681	5.9473	0.391	10.4917	5.7820	0.422
1 000	10.9398	5.1459	5.7939	3.75	11.0262	6.1559	4.156
10 000	10.9650	5.0017	5.9632	37.609	10.9986	5.9699	42.516
100	10.9828	5.0450	5.9378	377.078	10.9813	5.9353	432.032
500	10.9801	5.0503	5.9298	1919.67	10.9814	5.9246	1982.22

5. Conclusion

In this paper we have focused on basic ways to improve the efficiency of Monte Carlo simulation. We have described and applied the most important ones, which can be also regarded as a general – thus they are useful for general pricing problems.

We have examined the efficiency of selected approaches in case of (i) generating random numbers from prespecified distributions and (ii) option pricing. In the first case, we have seen that the effect (improvement) of these methods cannot be clear. However, when applied in pricing procedure the usefulness was clear.

Simultaneously, we have observed convergence of particular pricing problems. Relevant charts give us clear conclusion of efficiency of these methods. Note however, that pricing of barrier options is a complex problem

[7] Convergence of up-and-out as well as up-and-in call option under BS model is apparent from Appendix II and Appendix III.

through the (dis)continuous set of relevant prices. Therefore, it is much more important to examine whole family of variants – when to stratify, when to make the test, etc.

References

[1] AVRAMIDIS, A. N., L'ECUYER, P., TREMBLAY, P. A. (2003): Efficient Simulation of Gamma and Variance Gamma Processes. In Chick *et al.* (ed): *Proceedings of the 2003 Winter Simulation Conference*, 319-326, 2003

[2] BARRAQUAND, J. Numerical valuation of high dimensional multivariate European securities. *Management Science* 41, 1882-1891, 1995.

[3] BARRAQUAND, J., MARTINEAU, D. Numerical valuation of high-dimensional multivariate American securities. *Journal of Financial and Quantitative Analysis* 30, 383–405, 1995.

[4] BARNDORFF-NIELSEN, O. E. Normal inverse Gausian distributions and the modeling of stock returns, *Research report No. 300,* Department of Theoretical Statistics, Aarhus University, 1995.

[5] BARNDORFF-NIELSEN, O. E., SHEPHARD, N. Non-Gaussian Ornstein-Uhlenbeck Based Models and Some of Their Uses in Financial Econometrics, *Journal of the Royal Statistical Society, Series B* 63, 167-241, 2001.

[6] BARNDORFF-NIELSEN, O. E., SHEPHARD, N. (2005): Impact of jumps on returns and realised variances: econometric analysis of time-deformed Lévy processes, *Journal of Econometrics*, forthcoming 2005.

[7] BLACK, F., SCHOLES, M. (1973): The Pricing of Options and Corporate Liabilities*, Journal of Political Economy*, 81 (May-June 1973), 637-659, 1973.

[8] BOYLE, P. (1977): Options: a Monte Carlo Approach. *Journal of Financial Economics*, 4, 323-338, 1977.

[9] BOYLE, P., BROADIE, M., GLASSERMAN, P. Monte Carlo methods for security pricing. *Journal of Economic Dynamics and Control* 21, 1267-1321, 1997.

[10] FAMA, E. F. The Behaviour of Stock Market Prices, *Journal of Business*, 38, 34-105, 1965.

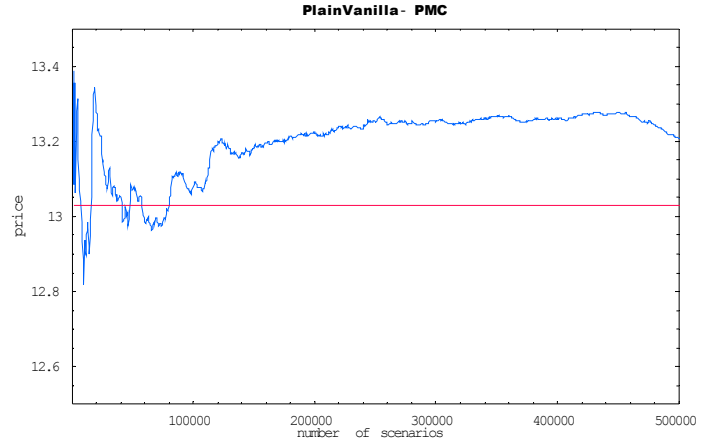
[11] FAURE, H. Suggestions for Quasi-Monte Carlo Users, *Lecture Notes in Pure and Applied Mathematics*, Vol. 141, Marcel Dekker. 1993.

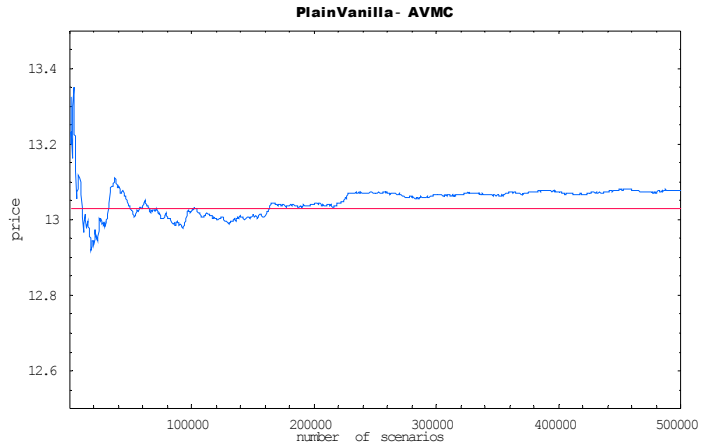
[12] FUJIWARA, T., MIYAHARA, Y. (2003): The minimal entropy martingale measures for geometric Lévy processes. *Finance and Stochastics* 7, 509-531, 2003.

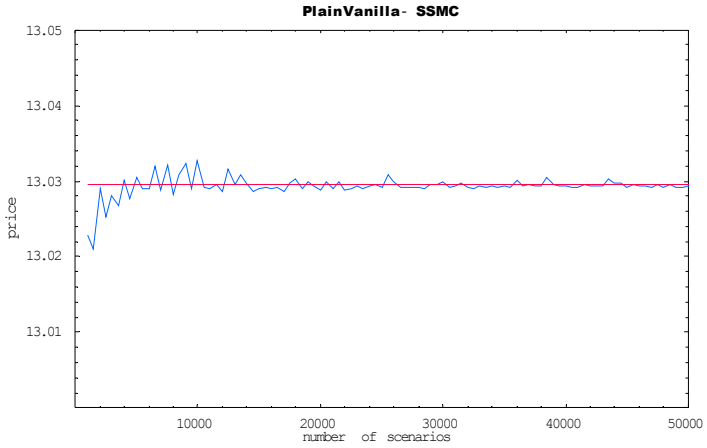
[13] CARR, P., GEMAN, H., MADAN, D. B., YOR, M. Stochastic Volatility for Lévy Processes, *Mathematical Finance*, 2003.
[14] CHARNES, J. M. (2000): Using Simulation for Option Pricing in *Proceedings of the Winter Simulation Conference*. Orlando, FL, 2000.
[15] CONT, R., TANKOV, P. (2004). *Financial Modelling with Jump Processes*. Chapman & Hall/CRC press. 2004.
[16] COX, J. C., INGERSOLL, J., ROSS, S. A. (1985): A theory of the term structure of interest rates. *Econometrica* 41, 135-156, 1985.
[17] DUAN, J. C., SIMONATO, J. G. Empirical martingale simulation for asset prices. *Managament Science* 44, 1218-1233, 1998
[18] EBERLEIN, E. – KELLER, U. Hyperbolic Distributions in Finance. *Bernoulli* 1, 281-299, 1995.
[19] HALTON, J. H. On the Efficiency of Certain Quasi-Random Sequences of Points in Evaluating Multi-dimensional Integrals. *Numerical Mathematics* 2, 84-90, 1960.
[20] HAMMERSLEY, J. M., HANDSCOMB, D. C. *Monte Carlo Methods*, Methuen, 1964
[21] GEMAN, H., MADAN, D. B., YOR, M. Time changes for Lévy processes, *Mathematical Finance*, 11:79–96, 2001.
[22] GLASSERMAN, P. *Monte Carlo Methods in Financial Engineering*, Springer-Verlag, 2004.
[23] HESTON, S. (1993): A closed form solution for options with stochastic volatility with application to bond and currency options. *Review of Financial Studies* 6, 327-343, 1993.
[24] HULL, J. C. (2002): *Options, Futures, & other Derivatives*. Prentice Hall. 2002.
[25] HULL, J. C., WHITE, A. (1987): The pricing of options on assets with stochastic volatility. *Journal of Finance* 42, 281-300. 1987.
[26] KEMNA, A. G. Z., VORST, A. C. F. A pricing method for options based on average asset values. *Journal of Banking and Finance* 14, 113-129,1990
[27] MADAN, D. B., CARR, P., CHANG, E. C. The variance gamma process and option pricing, *European Finance Review*, 2:79–105, 1998.
[28] MADAN, D. B., MILNE, F. Option pricing with VG martingale components, *Mathematical Finance* 1, 39-56, 1991
[29] MADAN, D. B. – SENETA, E. The VG model for Share Market Returns, *Journal of Business,* 63, 4, 511-524, 1990.
[30] MERTON, R. C. (1976). Option Pricing When Underlying Stock Returns are Discontinuous, *Journal of Financial Economics* 3 (January-February), 1976.

[31] MCKAY, M. D., CONOVER, W. J., BECKMAN, R. J. A comparison of three methods for selecting input variables in the analysis of output from a computer code. *Technometrics* 21, 239-245, 1979.
[32] NIEDERREITER, H. *Random Number Generation and Quasi-Monte Carlo Methods*. CBMS-NSF Regional Conference Series In Applied Mathematics, Vol. 63. Society for Industrial and Applied Mathematics. 1992.
[33] ÖTKEN, G. Quasi-Monte Carlo Methods in Option Pricing, *Mathematica in Education and Research* 8 (3-4), 52-57, 1999.
[34] RIBEIRO, C., WEBBER, N. Valuing path dependent options in the Variance Gamma model by Monte Carlo with a Gamma Bridge, *Journal of Computational Finance* 7 (2), winter 2003/2004
[35] SCHOUTENS, W. The Maixner process in Finance. *EURANDOM Report 2001-2002*, EURANDOM, Eindhoven, 2001.
[36] SCHOUTENS, W. *Lévy processes in Finance*: *Pricing Financial Derivatives*, Wiley, 2003.
[37] STEIN, M. Large sample properties of simulations using Latin hypercube sampling. *Technometrics* 29, 143-151, 1987.
[38] WOŹNIAKOWSKI, H. Average-case complexity of multivariate integration. *Bull. Amer.Math. Soc. (new series*) 24 (1), 185-194, 1991.
[39] TICHÝ, T. Efficient pricing of barrier options in the Variance gamma model. *In Dluhošová D. Nové přístupy a finanční nástroje ve finančním rozhodování*, VŠB-TU Ostrava, 2004.
[40] TICHÝ, T. Aplikace replikačních metod při ocenění a zajištění bariérových opcí. *Finance a Úvěr – Czech Journal of Economics and Finance* 54 (7-8), 305-324, 2004.

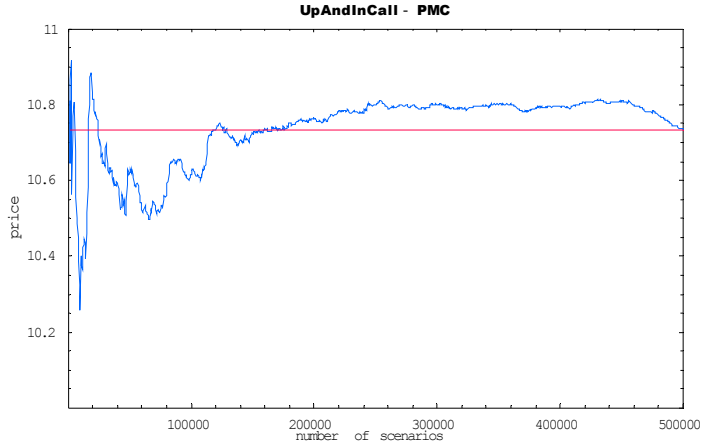
Appendix I – Convergence of plain vanilla call within BS setting

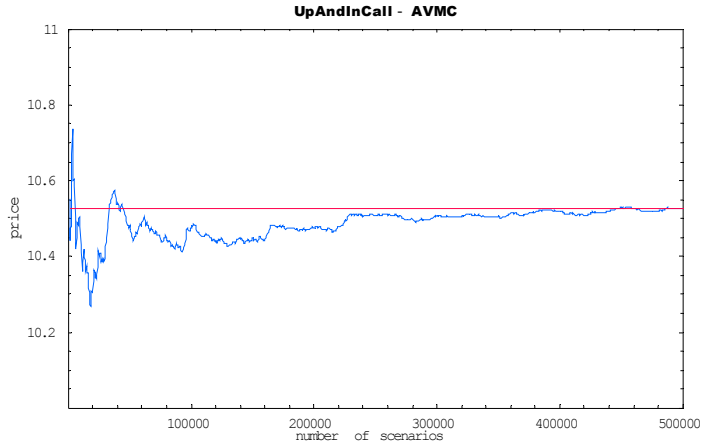


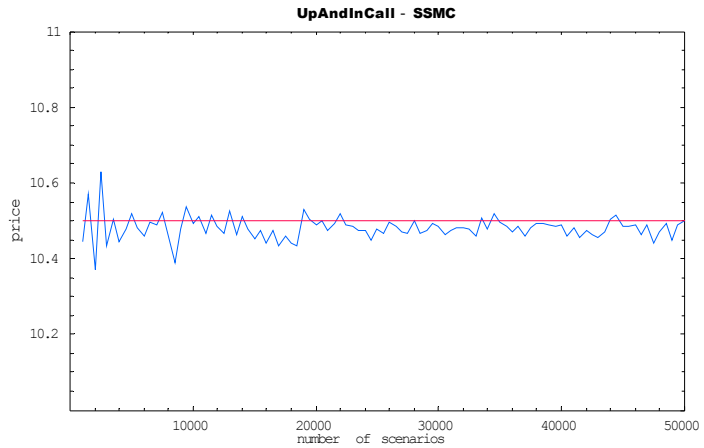




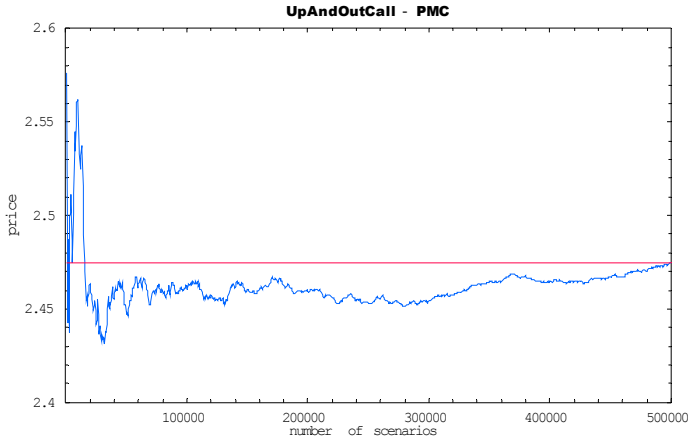
Appendix II – Convergence of up-and-in call within BS setting

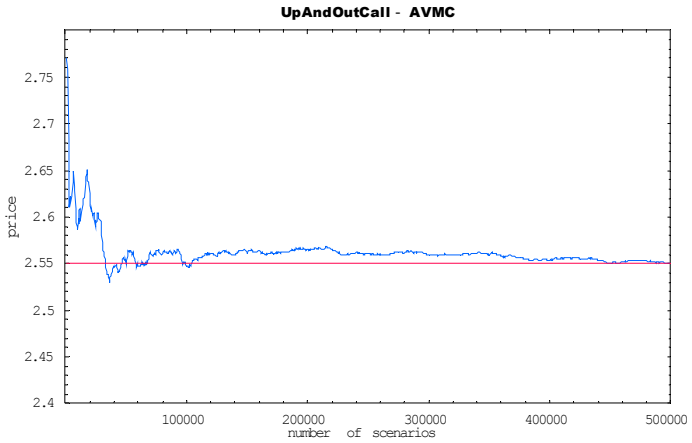


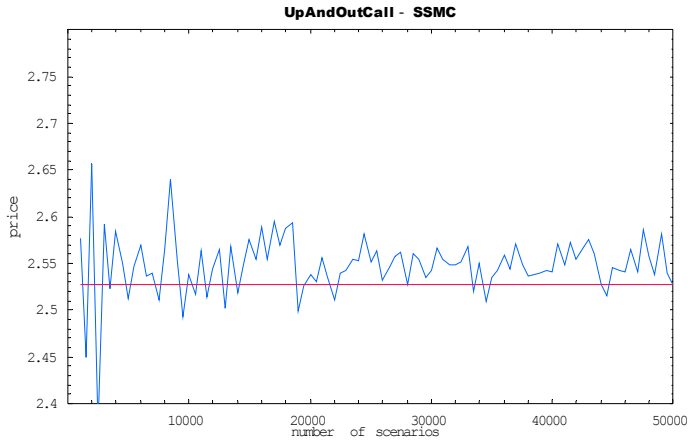




Appendix III – Convergence of up-and-out call within BS setting







M/B RATIO AND SIZE ON A SMALL STOCK MARKET

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Abstract

This study examines the relationship between the market-to-book (M/B) ratio, size, and current returns of Icelandic stocks. The study uses monthly return data on stocks from the Iceland Stock Exchange from July 1997 to June 2003. The methodology applied in this research can be divided into two parts. First, the data from individual stocks are analyzed; portfolios are then formed and their returns examined. Analysis of the results of studying individual stocks reveals no relationship between size and returns, but a very significant one between M/B ratio and returns. However, there is no significant relationship between returns, M/B ratio, and size when the performance of portfolios is analyzed.

Keywords: *Market efficiency, Icelandic stock market, Market-to-Book ratio, size*

1. Introduction

In this paper, empirical tests are performed to determine whether the Icelandic stock market shows clear signs of the market inefficiency that is apparent in other capital markets. Empirical tests are performed to study the relationship between market-to-book (M/B) ratios, i.e. the market value of common stocks divided by the book value of ordinary shareholders' funds, size, and returns of Icelandic stocks. This research is divided into two parts. First, data on returns, M/B ratios, and size of individual stocks are analyzed. Portfolios are then formed based on the variables examined and their performance compared. The findings are that there is no apparent relationship between the size measured by market value of common stocks and their returns. On the other hand, there is a statistically significant relationship between M/B ratios and returns when using data from individual stocks, but those results are not statistically significant when analyzing the performance of portfolios.

An efficient capital market is one in which stock prices fully reflect available information. The notion that stocks already reflect all available information is referred to as the efficient market hypothesis (EMH). A precondition for the strong version of the hypothesis is that information and trading costs, the costs of getting prices to reflect information, are always zero (Grossman and Stiglitz, 1980). A weaker and economically more sensible version of the efficiency hypothesis states that security prices reflect information to the point where the marginal benefits of acting on information, i.e., the profits to be made, do not exceed the marginal costs (Jensen, 1968). Therefore, according to the EMH, stock prices change in response to new and unpredictable information and they follow a random walk—i.e., they are random and unpredictable.

It is common to distinguish between three versions of the EMH: the weak, the semistrong, and the strong forms. The weak form of the hypothesis asserts that stock prices already reflect all information that can be derived by examining trading data. The semistrong form of the hypothesis states that all publicly available information regarding the prospects of a firm must already be reflected in the stock price. Finally, the strong version of the EMH states that stock prices reflect all information relevant to the firm, even information available only to company insiders.

The relationship between risk and returns is an important subject when studying capital market efficiency. It is obvious that investment in riskier assets such as stocks should generate higher return than investment in less risky assets. It was not until the Capital Asset Pricing Model (CAPM) was developed that academics were able to measure risk and its return.

CAPM is based on the assumption that asset returns are linearly related to their covariance with the market's return. The CAPM assumes that assets with higher systematic risk have a higher return than assets with lower systematic risk, and that assets with the same systematic risk should give the same return. Therefore, if investors own stock with the same systematic risk as the market, i.e., the beta coefficient is 1, then the expected return is the same as the market return. If the beta coefficient is 0 then the expected return is the same as the risk-free rate of return. The CAPM also implies there is no relationship between firm-specific risk and returns because, by diversification, specific risk can be eliminated.

Markowitz (1959) laid the groundwork for the CAPM. In that seminal research, he cast the investor's portfolio selection problem in terms of expected return and variance of return. He argued that investors would optimally hold a mean–variance-efficient portfolio—i.e., a portfolio with the highest expected return for a given level of variance. Sharpe (1964) and Lintner (1965a) built on Markowitz's work to develop economy-wide implications. They showed that if investors have homogeneous expectations and optimally hold mean–variance-efficient portfolios, then, in the absence of market friction, the portfolio of all invested wealth, or the market portfolio, is itself a mean–variance-efficient portfolio.

The Sharpe and Lintner derivations of the CAPM assume the existence of lending and borrowing at a risk-free rate of interest. Using this version of the CAPM, for the expected returns of asset *i* we have:

$$E[R_i] = R_f + \beta_{im}(E[R_m] - R_f) \tag{1}$$

$$\beta_{im} = \frac{Cov[R_i, R_m]}{Var[R_m]}, \tag{2}$$

where $E[R_i]$ is the expected return of a security, R_f is the risk-free return, and $E[R_m]$ is the return of a market index.

The purpose of this study is to examine whether there has been a relationship between the size of Icelandic stocks, their M/B ratios, and the returns. A significant relationship between these variables and returns might be interpreted as a violation of EMH. These two variables, M/B ratio and size, were chosen because previous research has shown significant relationship between returns and those variables on international stock markets.

2. Previous Research

Considerable research has been undertaken to test the CAPM. The main findings have been that the CAPM is not entirely valid as a model that explains stock returns, and that factors other than beta provide a better explanation. The Lintner (1965b) study of the American stock market from 1954 to 1963 found that the Security Market Line, i.e., the line that shows the relationship between systematic risk (beta) and returns, was too flat. Higher returns were not proportional to higher systematic risk. Later research where the CAPM was tested on the American stock market has shown that for periods, even for a decade, stocks with higher systematic risk do not give higher returns. Research by Black et al. (1972) and Fama and MacBeth (1973) showed that returns of high beta stocks were lower than the CAPM model would have predicted. In their seminal research, Fama and French (1992) found no relationship between returns and beta on the US stock market from 1963 to 1990, but a weak positive relationship between 1941 and 1990.

These findings have led to the development of multifactor models. These models are based on the classical CAPM with a factor additional to the return of the market included to explain returns. The Fama and French (1992) findings were that a multifactor model where stock returns were explained by their M/B ratio (market value/shareholder's equity), size (market value of common stocks), and the market's return was considerably better at explaining stock returns than the classical CAPM.

Reinganum (1992) analyzed the returns of New York Stock Exchange stocks ranked by size from 1926 to 1989. He found that small firms gave returns with a higher average arithmetic mean for that period. The returns of the small firms were superior even when accounting for risk. In a study of UK market data from April 1961 to March 1985, Levis (1989) found that small firms outperformed larger firms in that they gave excess returns when adjusted for risk.

Small stocks' out performance of large stocks has been related to the higher cost of trading. The bid/ask spread is generally much higher for small stocks, making the cost of trading much higher. Another explanation is that smaller firms have different sector or industry distributions than do larger firms.

In their extensive study, Haugen and Baker (1996) analyzed data for five countries from 1985 to 1993. They found that stocks with low M/B ratios gave excess returns in the US, Germany, France, the UK, and Japan. The excess return was statistically highly significant in all of these countries. In recent research, Chan and Lakonishok (2004) studied American stocks from 1979 to 2002. They found that stocks with low M/B ratios had

considerably higher average returns than other stocks and that they were less risky.

Low M/B ratio stocks' out performance of high M/B ratio stocks has been related to the tendency of investors to overestimate growth for high-growth companies and to underestimate growth for low-growth companies. High-growth companies often sell at high M/B ratios, whereas low-growth companies sell at low M/B ratios, with the result that the stocks with low M/B ratios outperform the others.

An extensive study by Gunnlaugsson and Jonsson (2004) on the Icelandic stock market from January 1993 to June 2003 they applied the methodology of forming portfolios based on the variable examined. They found that there was a significant relationship between the P/E ratio and return. There was also an indication of relationship between sizes, i.e., small stocks gave higher returns, but that was not statistically significant, and a low M/B ratio correlated with higher returns; that relationship also was not statistically significant.

This research is a continuation of Gunnlaugsson and Jonsson's study. Data on size and M/B ratios of individual stocks are examined and the relationship with returns analyzed. Portfolios are formed based on the variables examined and their performance and risk studied.

3. Data and Methodology

The purpose of this research is to examine whether there has been a significant relationship between the M/B ratios, size, and returns of Icelandic stocks. The period this study covers is from July 1997 to June 2003. To represent the Icelandic stock market, 34 stocks were randomly selected and their monthly returns, M/B ratios, and size, i.e., market value of common stocks, were measured every month of the period covered by this study.

Statistical tests were then performed to assess whether there was a significant relationship between returns, size, and M/B ratios by applying ordinary least squares (OLS) on the following regression:

$$R_i - R_f = \alpha + \beta(R_m - R_f) + \gamma(M/B) + \lambda(S) + u \qquad (3)$$

where R_i is the return of individual stock, R_f is the risk-free return and, as a proxy, the monthly return of a three-month T-bill is used, a is the intercept, β = Covar (R_i, R_m)/σ^2 is the slope, R_m is the market return, and the ICEX-15 is used as a proxy for the market, *M/B* is the market to book ratio, *S* is the size of the stocks, i.e., their market value, and u is an error term. The

coefficients γ are λ key coefficients. They measure if there has been a significant relationship between returns, M/B ratio, and size, when controlling for the market return. If these coefficients are statistically significant, that might be an indication of market inefficiency.

In addition to the regression, using data on individual stocks, the previously mentioned portfolios were formed based on the variables examined, i.e., size and M/B ratios, and their performance was analyzed. For every month from July 1997 to June 2003, four portfolios were constructed based on the value of the variable examined. The stocks were equally weighted in the portfolios; i.e., the return of the portfolio was equal to the average return of the stocks. Then the returns of the stocks were measured and compared, and the returns of the extreme portfolios were tested to determine whether they were statistically different when accounting for systematic risk. As an example, when studying the relationship between size and returns, four portfolios were formed in the beginning of every month this research covered. Stocks were ranked according to their size into four portfolios. The smallest stocks were in Portfolio 1, and the largest in Portfolio 4. The performance (return) of the portfolios was then measured in the month. Each month this process was repeated and new portfolios were formed based on the market value of common stocks, and so on for the following months.

Statistical tests were then performed to examine whether there was a significant difference in return between the extreme Portfolios 1 and 4 when controlling for systematic risk. These statistical tests are based on an approach known as Jensen's alpha, which is one of many performance measures that are based on the classical CAPM. It is easily computed by finding the intercept, α_p in the regression:

$$R_p - R_f = \alpha_p + \beta_p (R_m - R_f) + u_p \qquad (4)$$

This method was introduced by Jensen (1968). The procedure allows the efficient estimation of α_p, a measure of the monthly excess return after adjustment for portfolio risk. Assuming the CAPM holds, the alphas on passively managed portfolios are expected to be zero because all securities are expected to lie on the security market line. Therefore, a significantly positive alpha of a portfolio indicates an excess return.

The goal of this study is to compare the performance of portfolios by applying the methodology of Jahnke et al. (1987). Rather than estimating the previous equation for two extreme portfolios, the required performance is estimated by using OLS on the following regression:

$$R_{pt} - R_{ft} = \alpha_p + d_L D_{pt} + \beta_p (R_{mt} - R_{ft}) + s_L S_{pt} + u_{pt} \qquad (5)$$

where R_{pt} is the return in month t (t = 1,..,72) earned by a portfolio purchased at the beginning of the month; α_p is the intercept, which equals the monthly abnormal performance of the portfolio that is not represented by a dummy variable, i.e., α_H; R_{ft} is the risk-free rate, i.e., the return of one-month Treasury bills in month t; β_p is the slope, which equals the systematic risk of the portfolio β_H, which is not represented by a dummy; R_{mt} is the rate of return on the ICEX-15 index in month t; D_{pt} is equal to zero for observations of the portfolio that are not represented by a dummy and one for all observations of the portfolio that are represented by a dummy variable; and u_{pt} is an error term assumed to have an expected value of zero and to be serially uncorrelated. $S_{pt} = D_{pt}(R_{mt} - R_{ft})$ for all observations. The coefficient α_p in the equation equals α_H, i.e., the measure of monthly abnormal performance for the portfolio that is not represented by a dummy variable, which means that D_{pt} = 0 for that portfolio. The coefficient d_L is a key parameter in this regression. It measures the difference between the excess returns of the portfolio that is not represented by a dummy variable and the portfolio that is represented by a dummy variable. It should be noted that $\alpha_p + d_L$ is equal to the alpha of the portfolio, which is represented by a dummy variable. Thus, we may use a t-test to determine if d_L is significantly different from zero. If d_L is significant, then the returns of the portfolios are significantly different when differences in systematic risk are taken into account. β_p equals β_H, i.e., the systematic risk (beta) of the portfolio, which is not represented by a dummy variable. Finally, s_L provides an estimate of the difference in systematic risk between the portfolio that is represented by a dummy variable and the one that is not, with $\beta_p + s_L$ being the systematic risk of the portfolio that is represented by a dummy variable, β_L.

4. Results

4.1 Individual stocks

In Table 1 the main results of the regression are from data used in regression applying Equation 3. The main finding is that there is a significant relationship between the M/B ratio and the return of Icelandic stocks. The coefficient γ is negative and statistically significant. This means that stocks with low M/B ratios had significantly higher average returns than stocks with high M/B ratios. The coefficient λ is not statistically significant so there was no significant relationship between the size and return of Icelandic stocks.

Table 1. Result of the regression applying data on individual stocks

	α	β	γ	λ	R^2
Coefficient	0.0076	0.81	–0.0021	–0.045	0.15
t-statistics	(*2.82)	(*19.09)	(*–6.24)	(–0.21)	
p-statistics	0.0048	<0.0001	<0.0001	0.83	
Durbin W.	1.63			n = 2,181	

*Significant at the 5% level.

4.2 Portfolios

Figure 1 shows the average return of portfolios formed according to the size of the stocks (market value). The figure shows that the portfolio with the smallest stocks had the highest average return, approximately 0.8% per month. The portfolio with the largest stocks had the second highest return, 0.7% per month. The portfolios of stocks of medium size, portfolios 2 and 3, had the lowest average returns.

Figure 1. Returns of portfolios constructed according to firm size

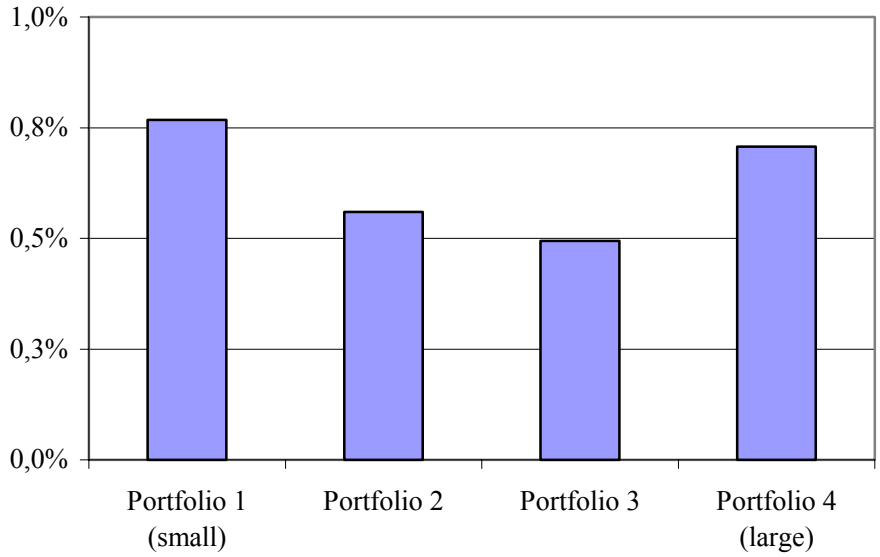

Table 2 shows the main result where the performances of Portfolios 1 and 4 are compared using regression applying Equation 5. Not surprisingly, the findings are that there is no difference in risk-adjusted returns between the portfolios as shown by the very insignificant d_L coefficient. The systematic risk (beta) of the portfolio formed from the smallest stocks is lower than the systematic risk of the largest stocks as indicated by the negative s_L coefficient. The difference in systematic risk is not statistically significant. These results clearly indicate that there was no relationship between the size and return of Icelandic stocks.

Table 2. Results of the regression of portfolios constructed according to firm size

	α_P	d_L	β_p	s_L	R^2
Coefficient	0.0023	0.00019	0.94	–0.16	0.57
t-statistics	(0.59)	(0.03)	(*10.4)	(–1.22)	
p-statistics	0.56	0.97	<0.0001	0.22	
Durbin W.	1.99			n=144	

* Significant at the 5% level.

Figure 2 shows the average return of portfolios constructed according to the M/B ratios. The figure shows that the return of Portfolio 4, i.e., the

portfolio with the stocks with the highest M/B ratio was lowest, at only 0.18% per month. Portfolio 2 had the highest average return or 1.03% per month. The figure indicates a possible relationship between M/B ratios and returns on the Icelandic stock market.

Figure 2. Returns of portfolios constructed according to firms' M/B ratios

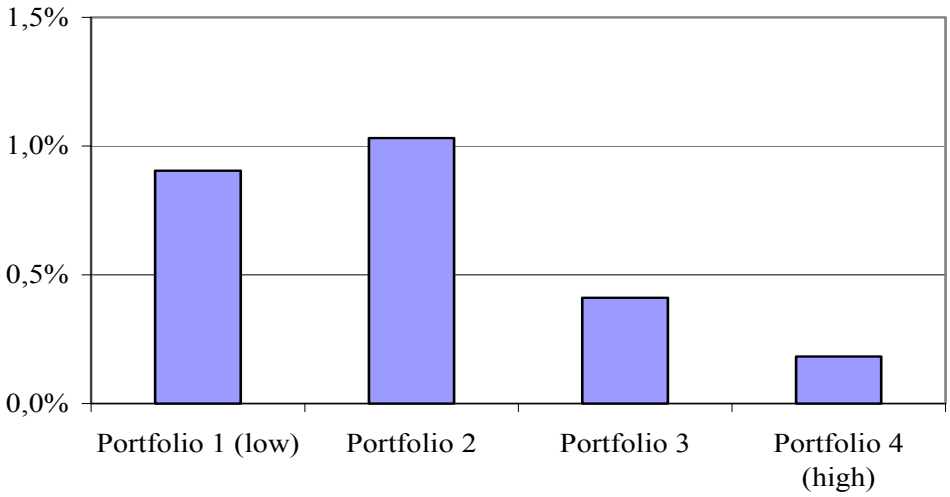

Table 3 shows the main result where the performances of Portfolios 1 and 4 are compared applying regression using Equation 5. The findings are that there is a difference in return between Portfolios 1 and 4 when adjusting for systematic risk as the coefficient d_L indicates. The coefficient is, however, not statistically significant, so the difference in return also is not statistically significant. Portfolio 1 has lower systematic risk than Portfolio 4 as the negative s_L indicates; however, the difference in systematic risk between the portfolios is not statistically significant.

Table 3. Results of the regression of portfolios constructed according to M/B ratios

	α_P	d_L	β_p	s_L	R^2
Coefficient	–0.0027	0.0066	1.04	–0.23	0.47
t-statistics	(–0.51)	(0.91)	(*8.71)	(*–1.35)	
p-statistics	0.61	0.37	<0.0001	0.18	
Durbin W.	2.02			n=144	

* Significant at the 5% level.

5 Conclusion

This paper reported empirical tests that were performed to determine whether the Icelandic stock market showed the clear signs of market inefficiency that have appeared on other capital markets. Empirical tests were performed to study the relationship between the M/B ratios, size, and returns of Icelandic stocks. This research was divided in two parts. First, data on returns, M/B ratios, and size of individual stocks were analyzed. Portfolios were then formed based on the variables examined and their performance was compared. The findings are that there is no apparent relationship between the size measured by market value of common stocks and returns. On the other hand, there was a statistically significant relationship between M/B ratios and returns when using data from individual stocks, but those results were not statistically significant when analyzing the performance of portfolios. The reason for that might be the number of data points, which are more than 15 times more numerous than when analyzing individual stocks rather than portfolios.

The finding that stocks with low M/B ratios provide high returns on the Icelandic stock market is consistent with findings on other stock markets. It is interesting that the small and underdeveloped Icelandic stock market shares the same signs of inefficiency that appear in larger and more developed stock markets.

References

[1] BLACK, F., JENSEN, M.C. and SCHOLES, M.S. (1972). The Capital Asset Pricing Model: Some Empirical Tests. In M.C. Jensen (ed). Studies in the Theory of Capital Markets. New York: Praeger.

[2] CHAN, K. and LAKONISHOK, J. (2004). Value and Growth Investing: Review and Update. Financial Analysts Journal, 60, 71–86.

[3] FAMA, E. and MACBETH, J. (1973). Risk, Return and Equilibrium: Empirical Tests. Journal of Political Economy, 71, 607–636.

[4] FAMA, E. and FRENCH, K. (1992). The Cross-section of Expected Stock Returns. Journal of Finance, 47, 427–462.

[5] GROSSMAN, S. and STIGLITZ, J. (1980). On the impossibility of informationally efficient markets. American Economic Review, (70), 393–408.
[6] GUNNLAUGSSON, S.B., JONSSON, A. and (2004). Umframávöxtun á íslenskum hlutabréfamarkaði. Tímarit um viðskipti og efnahagsmál, 2, 67–85.
[7] HAUGEN, R.A. and BAKER, N.L. (1996). Commonality in the Determinants of Expected Stock Returns. Journal of Financial Economics, 41, 401–439.
[8] Iceland Stock Exchange (2004) data from 2004.
[9] JAHNKE, G., KLAFFKE, S.J. and OPPENHEIMER, H.R. (1987). Price–earnings ratios and security performance. Journal of Portfolio Management, (14), 39–46.
[10] JENSEN, M. (1968). The Performance of Mutual Funds in the Period 1945–1964. Journal of Finance, 23, 389–416.
[11] LINTNER, J. (1965a). The Valuation of Risky Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. Review of Economics and Statistics, 47, 13–37.
[12] LINTNER, J. (1965b). Security Prices, Risk and Maximal Gains from Diversification. Journal of Finance, 20, 587–615.
[13] MARKOWITZ, H. (1959). Portfolio Selection: Efficient Diversification of Investments. New York: John Wiley.
[14] REINGANUM, M.R. (1992). A Revival of the Small Firm Effect. Journal of Portfolio Management, 18, 55–62.
[15] SHARPE, W. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. Journal of Finance, 19, 425–442.

DETERMINANTS OF AGENCY COSTS IN SLOVAK CORPORATIONS

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Abstract

The paper builds on theoretical arguments suggesting that the debt-equity ratio is related to agency costs. Two predictions prevail. First, leverage aggravates agency conflicts between shareholders and bondholders. Frequently cited examples are (1) the direct wealth transfer problem, (2) the asset substitution problem and (3) the underinvestment problem. Second, leverage mitigates agency problems that arise from managerial behavior that conflicts with the interest of shareholders. Well-known example is the overinvestment problem. For analysis, we used questionnaire data of non-financial firms in Slovakia. The analysis itself uses structural equations modeling with confirmatory analysis. The structural equations model describes the relationships between the variables in the model and the endogenous variables are four agency problems mentioned above. Each of these four endogenous variables is potentially determined by a wide set of exogenous variables. The main result of the research is that direct relations between leverage and agency problems seem to be absent. This does not imply that the agency problems are irrelevant. However, other instruments than leverage affect agency problems.

Keywords: *agency cost; leverage; capital structure*

1. Introduction

In the paper we develop a model that helps to examine the presence of agency cost in financing decisions and capital structure decisions. For the purpose of this paper, we define agency cost as a direct and indirect cost caused by conflicts between stakeholders in the corporation. Many empirical studies provide tests of the relevance of agency problems in a capital structure setting. In these studies, it is assumed that direct relations between determinants of agency problems and leverage are caused by agency problems. The contribution of this paper is to apply and investigate potential influences of determinants of agency problems from these studies on decision making process in Slovak corporations.

2. Theories and hypothesis of agency problems and debt

The pioneering work in the field of corporate capital structure is the paper of Modigliani and Miller (1958) about the irrelevance of financing choice between debt and equity. After this paper a vast and rapidly growing literature deals with potential relations between this choice and agency problems. We can briefly summarize the ideas behind the theories that we test in the present article. Additionally, we mention and discuss empirical studies and hypothesis used to test the theories.

2.1 Shareholder – bondholder conflicts

In the shareholder-bondholder conflicts shareholders make decisions transferring wealth from bondholders to shareholders. However, the bondholders are aware of the situations in which this wealth expropriation may occur. Therefore, they will demand a higher return on their bonds. Shareholders, foreseeing the bondholders' reaction, can mitigate the potential conflicts. Three potential conflicts can be distinguished: direct wealth transfer, asset substitution, and underinvestment. In the case of direct wealth transfer conflicts, dividends are increased or debt with higher priority is issued (Smith and Warner (1979)). In the case of asset substitution, the firm is substituting current projects for projects which have higher risk (Jensen and Meckling (1976)). As the bondholders are compensated given the risk of the current projects, wealth is transferred from bondholders to shareholders. In Myers' (1977) underinvestment problem, growth options will not be exercised because, due to the overhang of debt, the equity needed to finance these growth opportunities will not be provided by the shareholders. The shareholder-bondholder conflicts can be mitigated by adjusting the properties of the debt contract. This can take several forms. First, the contents of the debt contract can be adjusted by including covenants (Smith and Warner

(1979)). For example, a covenant can contain restrictions on the payment of dividends or the disposition of assets. Second, debt can be secured by collateralization of tangible assets in the debt contract. Third, convertible debt or debt with warrants can be issued (Jensen and Meckling (1976) and Green (1984). Fourth, the maturity of debt can be shortened (Myers (1977)).

The empirical studies related to the shareholder-bondholder conflicts mainly focus on the degree to which a firm can secure its debt and the firm's growth opportunities, both in relation to the relative amount of debt. In Titman and Wessels (1988) the relative amount of fixed assets is used to approximate the relative amount of secured debt, which is a potential mitigating factor of wealth distribution and asset substitution. Titman and Wessels find no significant relationship for the expected positive relationship. However, it remains unclear whether this result is caused by agency problems or, for example, by decreasing bankruptcy costs. In Titman and Wessels (1988), Smith and Watts (1992), McConnell and Servaes (1995), and Lang, Ofek, and Stulz (1996) variables are used to approximate growth opportunities, which are hypothesized to aggravate underinvestment. The results are mixed, which is probably caused by the difficulty to measure growth opportunities from publicly available data. Titman and Wessels (1988) do not find the expected negative influence of proxies for growth opportunities on leverage, whereas Smith and Watts (1992) find the predicted effect. McConnell and Servaes (1995) and Lang, Ofek, and Stulz (1996) perform similar tests for a subsample of high-growth firms. The former study notices a significantly negative relationship between growth opportunities and leverage, while the latter finds no relationship. In these studies the properties of the debt contract that are mitigating factors of the underinvestment problem are not taken into account.

2.2 The shareholder – management conflicts

The conflicts between shareholders and management that stem from the separation of ownership and control are introduced by Jensen and Meckling (1976). The overinvestment problem of Jensen (1986) is a further elaboration of their theory. According to the overinvestment hypothesis, managers have incentives to cause their firm to grow beyond the optimal size and to accept projects with a negative value to the firm. Jensen argues that overinvestment is aggravated by more free cash flow and less growth opportunities. The overinvestment problem can be mitigated by issuing debt and Jensen refers to this nondiscretionary nature as the disciplining role of debt. Alternative mechanisms to control overinvestment exist. First, the managers' income can be made dependent upon the performance of the firm. This can be accomplished by means of managerial shareholdings or option plans, or by compensation schemes. Second, internal and external corporate

control mechanisms may mitigate overinvestment. The internal control mechanisms include monitoring by the board, large shareholders, or banks. An example of an external control mechanism is the market for corporate control, which is characterized by hostile takeovers.

Several empirical studies examine the overinvestment problem by analyzing the relationship between growth opportunities and free cash flow on the one hand, and leverage on the other. Smith and Watts (1992) do not differentiate between overinvestment and underinvestment and find the predicted negative relationship between debt and growth opportunities. McConnell and Servaes (1995) amend the test by examining the overinvestment hypothesis for a sample of low-growth firms, and include managerial shareholdings as a mitigating factor. They conclude that the results confirm the overinvestment hypothesis. In the study of Lang, Ofek, and Stulz (1996) the overinvestment hypothesis is also tested for a sample of low-growth firms, and a proxy for the availability of free cash flow is included. In line with the overinvestment hypothesis, a significantly negative relationship between debt and proxies for growth opportunities is found. Berger, Ofek, and Yermack (1997) test the influence of governance characteristics on leverage. Both studies find that alignment of interest, through managerial shareholdings and option plans, induces leverage. As a result of monitoring, the presence of large shareholders is found to increase leverage. Similarly, relationships with banks induce leverage.

2.3 Summarization of the hypothesis

In the following Table 1 we present theoretical relations (positive or negative) between four agency problems specified above and potential determinants of agency costs.

Table 1 The endogenous relations between leverage and agency costs

Theories and determinants	*Expected relationship*
1. Shareholder vs. bondholder conflict	
• direct wealth transfer problem	
o leverage	positive
o covenants	negative
o secured debt	negative
o convertible debt	negative
o short-term debt	negative
• asset substitution problem	
o leverage	positive
o covenants	negative
o secured debt	negative
o convertible debt	negative
o short-term debt	negative
• underinvestment	
o leverage	positive
o growth opportunities	positive
o covenants	negative
o secured debt	negative
o convertible debt	negative
o short-term debt	negative
2. Shareholder vs. manager conflict	
• overinvestment	
o free cash flow	positive
o growth opportunities	negative
o managerial incentive structure	negative
o control structure	negative

3 The empirical model and data

The analysis is based upon results of questionnaires sent to the CFOs of over 100 non-financial firms. We received 46 usable questionnaires, what means the response rate of 45%. The questionnaire was completed anonymously. By means of questionnaire we asked financial managers for their opinion about firm characteristics. The reason for using questionnaire in opposite to accounting data was that we need specific information and the knowledge of the managers goes beyond publicly available data and includes internal information such as the presence of agency problems.

The data from questionnaires we included in the model. For model we used structural equations modeling with confirmatory analysis. The structural

equations model describes the relationships between the variables in the model. The endogenous variables are four agency problems – direct wealth transfer, asset substitution, underinvestment and overinvestment. Each of these variables is potentially determined by a wide set of exogenous variables and related to a subset of the other endogenous variables. The variables in the models are proxies of unobservable determinants that are derived from the theory. From the hypothesis in Table 1 we can derive a system of equations that describes the expected relationships. Summary of these relations in the structural equations model with both explained and explanatory variables is shown in the Table 2.

Table 2 Structural model

Explained variable	***Explanatory variables***
Wealth transfer	covenants, secured debt, convertible debt, short-term debt
Asset substitution	covenants, secured debt, convertible debt, short-term debt
Underinvestment	growth opportunities, covenants, secured debt, convertible debt, short-term debt
Overinvestment	free cash flow, growth opportunities, managerial incentive, structure, control structure

4 Results and conclusions

In the single-equation context we simplify each equation until all parameter estimates have absolute t-values that exceed a particular constant. Following suggestions in Haitovsky (1969), this is done by a series of estimations and t-tests, which we call the specification process. The first estimation model includes all variables. After the first estimation round the variable that has the lowest absolute t-value for its parameter estimate, is eliminated from the model. The resulting smaller model is re-estimated and a similar elimination procedure follows. The estimations and eliminations are stopped as soon as all t-values are larger in magnitude than the specified value. The constant in the model is, of course, never eliminated in this process. The single-equation method and the subsequent specification process lead to a relatively small system of equations than can be estimated by a full-information method. This estimation approach will lead to more efficient parameter estimates than those obtained in the single-equation context. The system includes among the explanatory variables the endogenous variables that are also present in the most general model and the exogenous variables that were not eliminated in the specification process.

Table 3 presents the OLS (Ordinary Least Squares) estimation results of the single equation models with stepwise deletion (in columns 2 – 4) of the variables reporting the lowest absolute t-value (t-value are in parentheses).

Table 3 Determinants of the agency problems

(1)	**(2)**	**(3)**	**(4)**
Direct wealth transfer:			
intercept	6,08 (7,32)	5,86 (14,47)	
short-term debt	-0,05 (-3,81)	-0,04 (-5.10)	
covenants dividend	-0,32 (-3,98)	-0.31 (-4.22)	
covenants investments	0,05 (0,34)		
secured debt	-0,04 (-0,36)		
R^2	0,4245	0.4496	
Substitution of assets:			
intercept	5,01 (3,81)	4,39 (4,25)	
short-term debt	0,01 (0,27)		
covenants dividend	-0,28 (-2,19)	-0,27 (2,31)	
covenants investments	0,17 (0,84)		
secured debt	-0,05 (-0,29)		
R^2	0,0718	0,1001	
Underinvestment:			
intercept	7,07 (4,89)	6,40 (9,11)	
short-term debt	-0,02 (0,07)		
growth opportunities	-0,76 (-4,18)	-0,72 (-4,39)	
covenants investments	-0,36 (-2,05)	-0,35 (-2,42)	
secured debt	-0,07 (-0,52)		
R^2	0,3243	0,3519	
Overinvestment:			
intercept	9,63 (12,82)	8,79 (19,11)	8,00
growth opportunity	0,19 (1,53)		(43,51)
free cash flow investment	-0,27 (-2,27)	-0,12 (-1,89)	
managerial shareholdings	0,07 (1,03)		
performance-based income	-0,65 (-4,99)	-0,48 (-8,19)	
asymmetric information	-0,03 (-0,52)		-0,39 (-
market control threat	-0,78 (-12,22)	-0,71 (-22,60)	11,52)
R^2	0,9348	0,9352	
			-0,72 (-
			22,04)
			0,9311

Analyzing the wealth transfer, the remaining two variables in the model confirm the expected relationship and have negative influence on the agency costs. Asset substitution seems to be statistically irrelevant for the research. Underinvestment problem is central in many theoretical and empirical studies. Both remaining variables in this model confirm theoretical assumptions. Overinvestment is theoretically considered as a very important factor influencing the capital structure. Exogenous variables in the model – performance based income and market control threat are fully correspondent with expected relations. Nevertheless, the variable "market for corporate control threat" seems to be very interesting, because of absence of this market in Slovakia.

The main result from the Table 3 is that direct relations between leverage and agency problems seem to be absent. This does not imply that the agency problems are irrelevant. However, other instruments than leverage affect agency problems. As expected, a positive relation between some exogenous variables and agency problems determinants has been found in the model.

In developing a sensible approach to capital structure strategy, the CFOs should start by thinking about firm's target capital structure, which is a ratio of debt to total capital, that can be expected to minimize taxes and contracting costs. In sum, to make a sensible decision about capital structure, CFOs must understand both the costs associated with deviating from the target capital structure and the costs of adjusting back toward the target. The next step forward in solving the capital structure problem is to involve a more formal weighing of these two sets of costs.

References

[1] BERGER, P.G. – OFEK, E. – YERMACK, D.L.: Managerial Entrenchment and Capital Structure Decisions. Journal of Finance. 1997, vol. 52, s. 1411 – 1438.

[2] FRIEND, I., LANG, H.P. An empirical test of the impact of managerial self-interest on corporate capital structure. Journal of Finance. 1988, vol. 43, pp. 271 – 281.

[3] GREEN, R.C. Investment incentives, debt and warrants. Journal of Financial Economics. 1984, vol. 13, pp. 115 – 135.

[4] HAITOVSKY, Y.: A Note on the Maximization of R^2. The American Statistician. 1969, vol. 23, pp. 20-21.
[5] JENSEN, M.C.: Agency Costs of Free Cash Flow, Corporate Finance and Takeovers. American Economic Review. 1986, vol. 76, pp. 323-339.
[6] JENSEN, M.C. – MECKLING, W.: Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. Journal of Financial Economics. 1976, vol. 3, pp. 305-360.
[7] KRIŠTOFÍK, P.: Determinanty zadlženia a modelovanie kapitálovej štruktúry. In: „Finanční řízení podniků a finančních institucí 2. díl – vybrané příspěvky“ Proceedings from 3. International conference VŠB TU Ostrava, Czech Republic, 11. – 12. 9. 2001, pp. 280 –285.
[8] LANG, L., OFEK, E., STULZ, R.M. Leverage, investment and firm growth. Journal of Financial Economics. 1996, vol. 40, pp. 3 – 29.
[9] McCONNELL, J.J., SERVAES, H. Equity, ownership and the two faces of debt. Journal of Financial Economics. 1995, vol. 39, pp. 131 – 157.
[10] MODIGLIANI, F. – MILLER, M.: The Cost of Capital, Corporation Finance and the Theory of Investment. American Economic Review. 1958, vol. 48, pp. 261 – 297.
[11] MYERS, S.C.: Determinants of Corporate Borrowing. Journal of Financial Economics. 1977, vol. 5, pp. 147-175.
[12] MYERS, S.C. – MAJLUF, N.S.: Corporate Financing and Investment Decision When Firms Have Information That Investors Do Not Have. Journal of Financial Economics. 1984, vol. 13, pp. 187-221.
[13] SMITH, C.W. – WARNER, J.B.: On Financial Contracting: An Analysis of Bond Covenants. Journal of Financial Economics. 1979, vol. 7, pp. 117-161.
[14] SMITH, C.W., WATTS, R.L. The investment opportunity set and corporate financing, dividend and compensation policies. Journal of Financial Economics. 1992, vol. 32, pp. 263 – 292.
[15] STULZ, R., JOHNSON, H. An analysis of secured debt. Journal of Financial Economics. 1985, vol. 13, pp. 501 – 522.
[16] TITMAN, S.: The Effect of Capital Structure on a Firm’s Liquidation Decision. Journal of Financial Economics. 1984, vol. 13, pp. 137-151.
[17] TITMAN, S. – WESSELS, R.: The Determinants of Capital Structure Choice. Journal of Finance. 1988, vol. 43, pp. 1-19.

VALUE MATRIX FOR THE PERFORMANCE OF ISTANBUL STOCK EXCHANGE

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Abstract

Performance analysis in stock markets is an area of great interest in both academic and commercial circles. Many trading strategies have been proposed and practiced from the perspectives of technical analysis, market making, external data indication, etc. This paper finds out evidence of a performance search based on a strategic planning approach suggested by Eren (2002) as Mcnamee used (1984). The paper examines corporate values of shares on Istanbul Stock Exchange (ISE), the only securities exchange in Turkey which is a growing emerging market with an increasing number of publicly traded companies and foreign participation. It provides an alternative analysis of firms listed on the Istanbul Stock Exchange (ISE) to value their performance as a guidance for investors. The ratios of return on equity of the firms and the cost of an alternative investment are taken to attain their value matrix (v-matrix) results. The v-matrix results point out to the rational sectors to invest in ISE and the rational investment in Turkey.

Keywords: *performance of stocks; return on equity; t-bills; value matrix*

1. Introduction

It is well-known that the majority of fund managers, financial planners, and investment advisors hold that investment in equity is the most appropriate way to build funds to meet major goals that are at least five to ten years off. This optimism about future stock returns has also become conventional wisdom for general investors. Many individual investors now expect not only that the stock market will outperform all other kinds of investments, but also that stock returns will exceed their long-run historical averages into the foreseeable future. It is equally well-known that these expectations are based largely on past experience rather than sound theory. In newspaper or journal articles, introductory textbooks, and news reports, and at professional meetings, the public is bombarded with data showing that in the long run no investment alternative comes close to stocks. In the last decade, for instance, the 15% average annual return on stocks was substantially higher than returns on other securities, as well as higher than the 10% average return on stocks over the previous 100 years. [1]

There are some market analysts like Pennar, Quinn and Zuckerman who do not believe that the current optimism about the future stock market is warranted. First of all, these skeptics believe that stock prices are too high relative to their fundamental value and anticipate a correction.[2] There are some critics that point to increased risk due to globalization, noting that as learned by various cases like that of US on October 27 in 1997, in a global economy, nobody is immune from shocks heard around the world. [3] Quinn notes that investors have forgotten or never knew that the stock market is a risky place.[4]

Studies of stock returns in emerging markets indicate that these markets are characterized by high volatility and abnormal returns. Investor interest in emerging markets exploded during the last decade as a result of the quest for higher returns. Yet little is known about the nature of stock in those markets. Variables like PAT/EQ (Profit After Taxes/Equity) ratios and dividend yields are reported to have some explanatory power for average market returns. [5] Like Bekaert et al., past empirical work of Basu (1983) and

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[1] Ahmet Baytaş; Nusret Çakıcı**, "**Do Stocks Really Provide The Highest Return In The Long Run?", **Journal of Investing**, Fall 99, Vol. 8 Issue 3, 1999, p. 89.
[2] Gregory Zuckerman. "Asset Allocators, Cautious on Stocks, Pile Into Bonds." **The Wall Street Journal**, June 3, 1997, p. C1.
[3] Karen Pennar. "After the Shock." **Business Week**, November 10, 1997, p. 38
[4] Jane B. Quinn, "What Should You Do?" **Newsweek**, November 10, 1997, p. 36
[5] Geert Bekaert; Claude Erb; Harvey Campbell; Tadas Viskanta, "The Cross- Sectional Determinants Of Emerging Market Equity Returns", **Quantitative Investing For the**

Ball (1988) on asset pricing has identified a number of variables that help explain stock returns in addition to the market risk variable. P/E ratio is found to have significant indicator in asset pricing tests.[6]

Odean (1998) developed a theoretical model of financial markets where investors suffer from overconfidence. This overconfidence model predicts that investors will trade to their detriment.[7] Barber and Odean (2000) estimated the monthly time-series regression of the monthly return on t-bills and the monthly return on a value-weighted market index for testing net performance of individual investors. [8] Similar to that, Asness (2000) tested the expected bond returns and stock returns in a model pointing the equity risk premium in investments.[9]

The study is concentrated on Istanbul Stock Exchange providing information on investing in Turkey. Turkey is a country offering significant opportunities for foreign investors with its geographically perfect position to function as a gateway between Europe, Middle East and Central Asia. The opportunities exist not only in the dynamic domestic market, but also throughout the region.

Turkey has a developed market economy, with a rich history of private enterprise. The Turkish financial sector is well developed in both technology and legal procedures. It is primarily built upon universal banking system and related areas like insurance, leasing, factoring and stock brokerage. Banks operate in accordance with international rules and practices offering a wide variety of services.[10]

Before 1980's, political turmoil, economic instability and institutional underdevelopment have traditionally been powerful obstacles regarding Turkish Financial Markets. But recently, markets in Turkey have witnessed an economic and financial development -merely the case of deregulation and

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Global Markets, Chicago, 1997, p. 221-272, http://faculty.fuqua.duke.edu/~charvey/Research/Chapters/C11_The_cross-sectional_determinants.pdf

[6] Levent Akdeniz; Aslıhan Altay Salih; Kürşat Aydoğan, A Cross-Section Of Expected Stock Returns On the Istanbul Stock Exchange, **Russian And East European Finance And Trade**, Vol. 36, No. 5, September-October 2000, p. 6.

[7] Terrance Odean, "Volume, Volatility, Price, and Profit When All Traders Are Above Average", **Journal of Finance**, No. 53, 1998, pp. 1887- 1934.

[8] Brad M. Barber; Terrance Odean, "Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors", **The Journal Of Finance**, No. 2, April 2000, p. 774.

[9] Clifford Asness, "Stocks Versus Bonds: Explaining The Equity Risk Premium", **Financial Analysts Journal**, March/April 2000, p. 98.

[10] ISE, www.ise.gov.tr

liberalization (financial openness). During 1990's, the accessibility to capital markets (especially the Istanbul Stock Exchange) has increased.

The Turkish economy and the stock market is characterized by high, sustained and variable inflation which is detrimental to an economy in terms of long-term growth, investments and operation of the financial system as a whole. Inflation is known to intensify all kinds of risk such as credit, capital, interest rate, investment, and liquidityrisks in the financial system resulting in increased uncertainty. Inflationary effects on stock market result in puzzling-stock return behavior. Recently, Barnes et al., (1999) clearly put forward that high inflation rates lead not only to greater inflation variability, but to greater variability in other rates of return as well.[11]

This paper does not focus directly on the future possibilities of the ISE. Itscontribution lies more in shedding additional light on the past experience of the market. In terms of a performance measure (PAT/EQ), we show that the performance of stocks compares much less favorably with that of treasury bills whereas Barber and Odean (2000) used as variables in another method they followed.

Accordingly, the paper is organized as follows: Section 2 gives information about ISE. Section 3 provides the data and the methodology in detail. Section 4 discusses the results, and Section 5 is devoted to the conclusions of the research.

2. Istanbul Stock Exchange (ISE)

The financial markets in Turkey were highly inefficient and strictly regulated until 1980. Attempts for the liberalization of the country in general and financial markets started at the beginning of 1980s. Things changed then when the Capital Markets Board was set up as the main regulatory board, capital instruments were defined and laws governing the issuing of securities were drawn up. The establishment of the legal framework and regulatory agencies for the stock market was completed in 1982.

At the end of 1985 the Istanbul Stock Exchange in its current form was established and it started trading in 1986. The exchange has shown remarkable growth both in terms of trading volume and number of listed companies. Today market capitalization, trading volume and the number of

[11] Cemal B. Oğuzsoy; Sibel Güven, "Stock Returns and The Day-of-the-week Effect in Istanbul Stock Exchange", **Applied Economics**, No. 35, 2003, p. 960.

companies listed in ISE are above those in Eastern European exchanges. ISE now, is the eighth largest market in Europe. [12]

ISE is responsible for developing and maintaining the central securities market of Turkey, under the supervision of Capital Markets Board. The CMB is a member of the International Organization of Securities Commission (IOSCO), and has chaired the Emerging Markets Committee of IOSCO since May 2002. The CMB is also a member of the Capital Market Regulatory and Supervisory Consultative Group.

Along with the Istanbul Stock Exchange, the Istanbul Gold Exchange started operations in 1995. An ISE International Market was set up in 1996 and started trading in 1997 but volumes still remain minimal.

Although segmented, Turkish Capital Markets have recently shown interest in opening their borders and relaxing foreign ownership and capital repatriation restrictions. Turkey is more integrated with the world markets in its region. It seems to process information flows from global markets and act as conduits to other smaller markets.[13]

Turkish market is also characterized by high risk free rates, therefore market timing or appropriately switching between the fixed income securities and the equities mightcreate higher returns for portfolio managers. ISE changes its basic characteristics quickly and carries additional risks due to the fact that it operates in a high and volatile inflation economy.[14]

The most important characteristics of capital market in Turkey is the predominance of the government securities. Because of tax burdens and availability of high income from government securities there is no encouragement for prospective issuers of corporate debt.[15]

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[12] Kürşat Aydoğan; Gülnur Muradoğlu, "Do Markets Learn From Experience? Price Reaction To Stock Dividends In The Turkish Market", **Applied Financial Economics**, No. 8, 1998, p. 42.

[13] Eric Girard; Enrico J. Ferreira, "On the Evoloution of Inter- and Intraregional Linkages to Middle East and North African Capital Markets", Quarterly Journal Of Business & Economics**, Volume 43, 2004, p. 42.**

[14] Aslıhan Altay Salih; Gülnur Muradoğlu; Muhammet Mercan, "Performance Of The Efficient Frontier In an Emerging Market Setting", **Applied Economics Letters**, 2002, p. 180

[15] TBB, Banks Report March 2005

Table 1: Financial Assets Of Capital Markets In Turkey (As percentage of GNP, %)

[1] CAPITAL MARKET	**[2]**	**2001**	**[3]**	**2002**	**[4]**	**2003**
[6] SHARES (ISE)	[7]	38	[8]	21	[9]	27
[11] BILLS AND BONDS	**[12]**	**68**	**[13]**	**55**	**[14]**	**55**
[16] INVESTMENT FUND	[17]	1	[18]	2	[19]	4
[21] TOTAL	[22]	107	[23]	76	[24]	82

Source: Capital Market Board (CMB), Central Bank Of Turkey (CBT)

Some other distinct characteristics of the Turkish Stock Market are the frequency and volume of stock dividends and right offerings. Stock dividends are declared from a revaluation fund, an equity account created as a result of inflation adjustment of fixed assets. Inflation in Turkey has decreased a great deal but still the problem with the revaluation fund remains and that leads to a change in balance sheets. Since 1983, corporations are permitted to adjust their financial statements for inflation by using revaluation method as a standard procedure. Revaluation, as exercised in Turkey, requires the increase of the book value of plant assets by a constant ratio, usually comparable to the inflation rate, announced by the Ministry of Finance. When the value of plant assets and related depreciation expenses are adjusted to inflation, an account called revaluation fund is credited and this account is listed under the equity. Corporations are also permitted to transfer the revaluation fund to paid-in capital by declaring stock dividends.[16]

[16] Aydoğan; Muradoğlu, p. 42.

3. Data and Methodology

The data used in this analysis contain the average yearly return (according to the latest year published- 2004) of the highest five and lowest five sectors traded in the ISE. After the initial sample selection and addressing the 10 sectors of ISE, the return on equity (PAT/EQ) of the firms listed on these sectors are calculated. The financial statement data were obtained from various ISE publications. In the second step, the yearly average compound rate of treasury bills (2004) is taken. The aim of comparison through the research as a whole was carried in another study whereas Gürsoy and Erzurumlu (2001) used returns of stocks and t-bills to be tested in another model.[17]

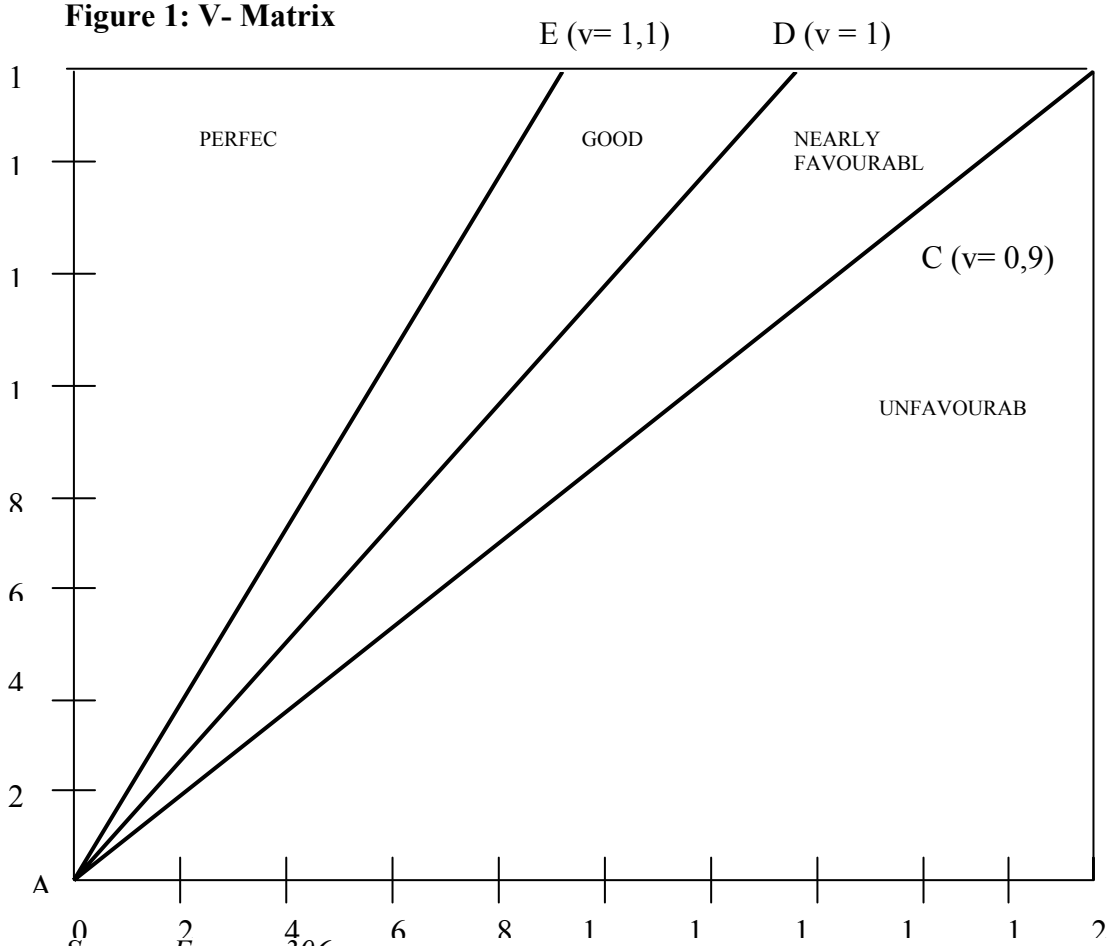
To facilitate the interaction between variables, we follow a methodology named as the Value Matrix used by McNamee (1984). The V-matrix suggested by Walsh and Mack is an alternative type of corporate planning. Walsh and Mack claimed that the cost of capital and the profitability of investments are crucial for business planning and portfolio analysis. It helps investors to quickly analyze past trends, assess their position and plan future strategic actions.[18] The aim of this research is to show the correct direction of investment in ISE for foreigners.

According to Walsh and Mack, the value matrix needs to be developed by the ratios of cost of capital and the profitability of investments. The cost of capital (representing t-bills in this research) based on current prices is on x-axis whereas the profitability (representing stocks in this research) of the business based on its investments is on y-axis. When the profitability of investments is equal to the cost of capital, it is shown with the AD diagonal. The value matrix -shown in Figure 1- is as follows: When the value of V is less than 1, the funds are invested unprofitably. On the other hand, when the value of V is 1, the funds are not profitable and when the value of V is greater than 1, the funds are invested to grow. The Strategic Business Units that are in the right below of the AD diagonal are unsuccessful whereas the SBUs that are in the left above of the AD diagonal are successful. The ADC triangle shows the area that is just below the equilibrium whereas the ADE triangle shows the area that is just above the equilibrium. The value matrix is used in the strategic planning of the companies. It is used to analyze the current situation and the annual trends. It

[17] Cudi Gürsoy; Ömer Erzurumlu, "Evaluation of Portfolio Performance of Turkish Investment Funds", **Doğuş Üniversitesi Dergisi**, No. 4, 2001, pp. 44-58.
[18] P. McNamee, "The V Matrix - A New Tool For Plotting", **Long Range Planning**, Vol. 17, No. 1, February 1984, p. 19-22.

is also used to keep the strategic plan and fix the unsuccessful performance of the company. The value matrix is important to compare the company with its competitors.[19]

Figure 1: V- Matrix



Source: Eren, p. 306

5. Research Findings

[19] Erol Eren, **Stratejik Yönetim ve İşletme Politikası**, Beta, 6. Baskı, 2002, pp. 305-306.

We computed the performance of ISE sectors and average t-bills in compound rate (Table 2). When we calculated for each year t-bills have a tendency to outperform. Just to show the results that resemble nearly the same in every year we chose 2004 to brief our study and Figure 2 represents the results of the v-matrix of the ISE's performance in 2004 compared with the performance of t-bills in 2004.

The results indicate that the ISE sectors do not show a satisfactory performance where they are unfavorable in v-matrix. One sector, *Defence* lays on over a little from t-bills where it is good in v-matrix. Two of the sectors, *Transportation* and *Manufacture Of Non-Metallic Mineral Products* are on the verge of growing and yet not profitable. Others are all unfavorable leading no growth. But more importantly, it was found that the best investment during the entire period is t-bills. The results of Gürsoy and Erzurumlu (2001) support our research that found t-bills to be the best investment rather than stocks over the entire analysis period in Turkey.

Table 2- Performance of Investments in Turkey- 2004 (stocks; t-bills)

[44] INFORMATION TECHNOLOGY	[45] 2
[26] ISE SECTORS*	***[27] Return on equity (%)***
[46] FOOD BEVERAGE	[47] 12,6
[28] DEFENCE	[29] 23,5
[48]	
[30] TRANSPORTATION	[31] 14,4
[49] ISTANBUL MARKET*	***[50] Return (%)***
[32] NON-METALLIC PRODUCTS	[33] 12,3
[51] T-BILLS compound rate	[52] 23,34
[34] INSURANCE COMPANIES	[35] 10,9
[36] BANKS	[37] 10,6
[38] RESTAURANTS AND HOTELS	[39] 10,14
[40] ELECTRICITY GAS COMPANIES	[41] 7,4
[42] OTHER MANUFACTURING INDUSTRY	[43] 4,5

*Source: * own calculation; ** Central Bank Of*

The case described above indicates two important points. Firstly, all the efforts of analyzing ISE to outperform market become highly questionable. This fact draws our attention to the second point, t-bills and their performance in Turkey, which interprets the results on ISE.

The results presented in Table 2 and Figure 2 show that t-bills are the best financial instruments merely helping to judge the ISE and its sectors' performance. The macroeconomic conditions under which the Turkish economy operates long before suggest a potential role for the results of our research. Turkish economy had and still has so many obstacles that investment incentives move towards financial instruments which are not risky. As a result of economical factors some risky investments alienate and their risk premium increases.

Despite the poor performance of ISE, we still can say that there are profitable stocks according to their good company profile. But sectors' performance is pushed down by companies that do not apply for the accepted company profile definition.

6. Conclusion

According to the conventional wisdom, stock portfolios are the best investment vehicles for long-term investors. But once returns are adjusted for risk, whether the risk measured is total risk or systematic risk, the worst performer is the stock market, while the bond market outperforms the convertible bond market. Even in terms of mean returns, unadjusted for risk, the convertible bond market outperforms stocks.

Of course, historical returns cannot tell us much about future returns in ISE. But they should prompt us to ask several questions. First of all, in light of the above research and critiques, the question of how to make ISE more outperforming and efficient and in what ways the new legal regulations could be introduced to achieve such goals are possible areas for new studies. Secondly, can a fund manager continue to advise clients as before? Or is more caution required? Have we all forgotten that stock market is a risky place, and that expectations of continually higher returns from the stock market might be unrealistic?

Economical conditions of countries and the resistance power against expected and unexpected fluctuations would change homogeneity in specific situations. The nation is heterogeneous in the case of critical evaluations and

expectations. Because of that reason analytical consideration changes dramatically from country to country.

Treasury bills outperform stocks in Turkey and this is alright as there is a strong effect of macroeconomic obstacles prevailing in the country since the early 1980s. There has been (and still is to some extent) a substantial amount of inflation, volatility, and political and economic uncertainty in the Turkish economy. After 1990s, Turkey has made progress in improving the functioning of markets and in strengthening the institutional framework for a fully functioning market economy. However, macroeconomic stability and predictability has not yet been achieved to a sufficient degree. Inflationary pressures have not sufficiently declined to allow economic agents to conduct medium term planning. High real interest rates impede productive investment. The banking sector is channeling financial capital towards the private sector only to a limited degree and the sector's consolidation process is not yet completed. The considerable costs of servicing the huge public sector debt are a considerable burden, absorbing a large fraction of Turkey's economic potential. As a result of a narrow capital market and the crowding out of private investment by the public sector financing requirement, the investment incentives do alter. These conditions increase the risk premium demanded by investors and can reduce investment demand or change investment incentives to some other instruments having lower risk.

A broader discussions of these problems goes beyond the scope of our present data and therefore of this paper. However, facts assembled in this paper constitute a background for the design of investments in Turkey. Meanwhile, efforts to address those remaining issues must be maintained.

References

[1] AKDENİZ, L., SALİH, A.A., AYDOĞAN, K. A Cross-Section of Expected Stock Returns On the Istanbul Stock Exchange. Russian and East European Finance and Trade. 2000, vol. 36, no. 5, p. 6.

[2] ASNESS, C. Stocks Versus Bonds: Explaining The Equity Risk Premium. Financial Analysts Journal. 2000, March/April, p. 98.

[3] AYDOĞAN, K., MURADOĞLU, G., Do Markets Learn From Experience? Price Reaction To Stock Dividends In The Turkish Market. Applied Financial Economics. 1998, no. 8, p. 42.

[4] BARBER, B.M., ODEAN, T. Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors. The Journal of Finance. 2000, no.2, p. 774.
[5] BAYTAŞ, A., ÇAKICI, N. Do Stocks Really Provide The Highest Return In The Long Run? Journal of Investing, 1999, vol. 8, issue 3, p. 89.
[6] BEKAERT, G., ERB, C., CAMPBELL, H., VISKANTA, T. The Cross-Sectional Determinants Of Emerging Market Equity Returns. Quantitative Investing for The Global Markets. 1997. pp. 221-272, http://faculty.fuqua.duke.edu/~charvey/ Research/Chapters/C11_The_cross-sectional_determinants.pdf
[7] EREN, E. Stratejik Yönetim ve İşletme Politikası. İstanbul: Beta, 2002.
[8] GIRARD, E., FERREIRA, E.J. On The Evoloution of Inter- and Intraregional Linkages to Middle East and North African Capital Markets. Quarterly Journal Of Business & Economics. 2004. vol. 43, p. 42.
[9] GÜRSOY, C., ERZURUMLU, Ö. Evaluation of Portfolio Performance of Turkish Investment Funds. Doğuş Üniversitesi Dergisi. 2001, no. 4, pp. 44-58.
[10] McNamee P. The V Matrix - A New Tool For Plotting. Long Range Planning. 1984, vol. 17, no. 1, pp. 19-22.
[11] PENNAR, K. After the Shock. Business Week. 1997, November 10. p. 36.
[12] QUINN, J., QUINN, B. What Should You Do? Newsweek. 1997, November 10, p. 36.
[13] ODEAN, T. Volume, Volatility, Price, and Profit When All Traders Are Above Average. Journal of Finance. 1998, no. 53, pp. 1887-1934.
[14] OĞUZSOY, C. B., Güven, S. Stock Returns and The Day-of-The-Week Effect in İstanbul Stock Exchange. Applied Economics. 2003, no. 35, p. 960.
[15] SALİH, A.A., MURADOĞLU, G., MERCAN, M. Performance Of The Efficient Frontier In an Emerging Market Setting. Applied Economics Letters. 2002. p. 180.
[16] TBB, Banks Report, 2005, March
[17] ZUCKERMAN, G. Asset Allocators, Cautious on Stocks, Pile Into Bonds, The Wall Street Journal, 1997, June 3, p. C1.
[18] www.cbt.gov.tr
[19] www.cmb.gov.tr
[20] www.ise.gov.tr