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The Impact of Credit Ratings in Emerging Stock Markets

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■ Vassiliki Malindretou*
■ Maria-Eleni K. Agoraki**

The 2008 financial crisis initiated an interesting academic debate considering the effects of credit ratings. Central and Eastern Europe's (CEE) emerging systems consist a unique political-economic case to investigate sovereign credit rating changes and their impact on stock price returns of the banking industry. This paper studies the stock price reaction of the banking sector when news of a sovereign rating change is made public, applying an event study methodology, in a sample of 13 emerging economies over the period 2000-2009. The principal hypothesis tested is that the market will react significantly to announcements of sovereign ratings with either positive or negative implications. Secondly, we estimate the determinants of possible abnormal returns associated with sovereign credit rating changes. The empirical results suggest that upgrade and affirm ratings do not have a significant effect on stock market returns, while market reacts negatively only to a downgrade announcement. Smaller banks experience larger stock price drops after a sovereign credit downgrade and larger increases in the case of a sovereign upgrade. Finally, banks in poorer emerging countries with less developed banking sectors, experience larger drops in the price of their shares after a downgrade.

Key words: Sovereign Credit Ratings (SCR); Abnormal returns (AR); Asymmetric Information (AI); Cumulative abnormal returns (CAR); Emerging markets (EM)

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1. Introduction

The 2008 financial crisis initiated a field of an interesting academic debate considering the effects of credit ratings. Especially, the debate is focused on the emerging economies, which seemed too weak against a global financial turmoil like the one of 2008. Central and Eastern Europe's (CEE) emerging systems consist a unique political-economic case to investigate sovereign credit rating changes and their impact on stock price returns. Holthausen and Leftwich (1986) is the first paper that used daily data to study the stock price reaction to credit rating changes. They found that rating downgrades by Moody's and Standard & Poor's provide information to the markets and impose costs to the firm by reducing the stock price, while they did not find a significant stock price reaction for rating upgrades. On the supervisory side, many studies have been launched with the aim of better understanding the credit rating industry and making policy recommendations to reform it (e.g., Basel Committee, 2000). Hand et al. (1992) argue that a price response on the announcement of a rating change is evidence that agencies provide some information not already incorporated in security price.

A sovereign rating is aimed at "measuring the risk that a government may default on its own obligations in either local or foreign currency. It takes into account both the ability and willingness of a government to repay its debt in a timely manner" (Moody's, 2006). Credit ratings can play a key role in financial markets, insofar as they are helping to reduce the asymmetric information which causes adverse selection and moral hazard, eroding market efficiency and resource allocation (Economaki-Malindretou, 2003). The information asymmetry between lenders and investors, on one side, and issuers on the other side, about the creditworthiness of companies (corporate risk) or countries (sovereign risk) is also reduced. On the other hand, credit ratings can enhance investors' confidence and reduce the cost of issuing debt, pointing also a viable and significant avenue for the private sector and supporting the nation's economic reconstruction (Elkhoury, 2008), while an improvement in the credit rating is considered to be an indication of a reduced likelihood of financial distress (Bongini et al., 2002).

In recent years, the demand for sovereign credit ratings has increased dramatically. To explore these questions, we present the first systematic analysis of the determinants and impact of the sovereign credit ratings assigned by the three leading agencies, Moody's Investors Service, Fitch and Standard and Poor's. This paper uses sovereign ratings to examine two different, but interrelated issues. First, investor reaction (especially in the case of banks) to sovereign rating announcements is specifically examined to determine if the rating itself provides new information to the market. The principal hypothesis tested is that the market will react significantly to announcements of sovereign rating with either positive or negative implications. Secondly, we estimate the determinants of possible abnormal returns associated with sovereign credit rating changes.

Sovereign ratings are important not only because some of the largest issuers in the international capital markets are national governments, but also because these assessments affect the ratings assigned to borrowers of the same nationality. In principle, the sovereign credit rating industry could help mitigate the congestion externalities common to world capital markets that arise from the failure of market participants to internalise the social cost of external borrowings. Many investors, in particular institutional investors, prefer rated over unrated securities, partly as a result of domestic prudential regulation. Sovereign yields also tend to rise as ratings worsen, reflecting the rise in the default risk premium (Cantor and Packer, 1996).

The rating classification of sovereign public debt is, somehow, besides being a measure of the solvency, an assessment of the economic, financial, and political situation of an economy, giving also a measure of the country's development. The relevance of rating the creditworthiness of sovereign borrowers arises from the fact that national governments are by far the largest issuers on capital markets and also because those country ratings are seen as an indication of public and private sector issues. However, the literature devoted to modelling sovereign credit rating is rather sparse (Cantor and Packer, 1996; Larrain et al., 1997) especially in the case of transition countries.

A sovereign credit rating reflects the rating agency's opinion on the ability and willingness of sovereign governments to service their outstanding financial obligations in full and on time (Moody's, 1996). These sovereign ratings reflect factors such as a country's economic status, transparency in the capital markets, levels of public and private investment flows, foreign direct investment, foreign currency reserves, and the ability of a country's economy to remain stable despite political change. An important difference between sovereign credit ratings and corporate credit ratings is that sovereign credit ratings have large effects and implications that spread to other entities besides the one being rated (Cantor and Packer, 1996).

Moreover, investors with interests in foreign firms pay attention not only to the foreign firm's credit rating (if it is available, which is a rather significant issue in the case of emerging markets) but also to the credit rating of the country where the firm is domiciled. The concept is based on the assumption that a sovereign default will force domestic issuers also to default because most circumstances leading to national debt crises directly affect the debt servicing capacity of private borrowers. On the other hand, investors tend to rely on sovereign ratings as convenient and intuitive aids in valuing projects in emerging countries where firm-level information is scarce (for a thorough analysis see also Cantor and Packer, 1995).

This paper studies the stock price reaction when news of a sovereign rating change is made public, applying an event study methodology (see also Holthausen and Leftwich, 1986). We especially focus on the reaction of the banking sector. Banks have a prominent role in the financial and business environment, while the increasing risks that banks face, have led to the introduction of the new regulatory framework of Basel II, which defines the core principles for financial risk management in banking institutions (see also Doumpos and Zopounidis, 2010). The pivotal role of banks (considering the generally under- developed capital markets) in shaping economic developments and even triggering changes at important junctures, make the banking sectors of these countries a distinct field of research.[1] No study has, however, looked at the informational content of credit ratings in Central and Eastern European countries. To conduct this analysis we collected all sovereign-rating changes issued by Standard and Poor's (S&P), Moody's and Fitch in 13 emerging economies (most of them transition)[2] over the period 2000-2009.

Our primary emphasis is on the two-day announcement period, although we report measures of abnormal performance for various sub periods. This paper studies also the factors that seem to play an important role in determining abnormal returns. An analysis of the possible determinants of abnormal returns around an announcement of a sovereign credit ratings assigned by the three leading credit rating agencies is conducted by using linear transformations of the rating scales, while the set of explanatory variables selected combines both bank specific as well as macroeconomic factors.

Two distinguishing characteristics of this study are worth noting. This is the first study, as far as we know, to consider the effect of sovereign credit ratings in Central and Eastern European countries. However, this focus limits data availability because most emerging-market government securities have been rated only since the late 1990s and are not regularly quoted on the financial markets. Even though restructuring was quite profound over the last decade in most Central Eastern European (CEE) countries, there is still much to be done for their financial systems to be classified in the category of developed markets.[3] During the last few years, the governments of these countries, with the collaboration and assistance of international financial institutions, have taken concrete and far-reaching measures to reform their financial institutions and markets. Since their transition to democracy and the market economy, Central and Eastern European economies have been steadily gravitating towards Western Europe, in terms of markets and institutions (EBRD, 2004). The varying transition paths from central planning to market economy have resulted in different legal and politico-institutional frameworks, which have consequently affected the efficient functioning of national economies in general. On the whole, and given the restructuring and regulatory initiatives that took place in the last decade, this region provides an excellent case for the study of credit ratings.

The structure of the paper is as follows. A review of the existing literature is presented in Section 2. Data description and the methods of analysis are discussed in Sections 3 and 4. Section 5 presents the results for the stock market response to rating announcement events, as well as the determinants of the abnormal returns. The final section concludes.

2. Literature review

Since the early 1990s the demand for sovereign credit ratings[4] has been increasing rapidly due to increasing levels of national government borrowing in the international capital markets. By reducing investors' uncertainty about risk exposures, sovereign credit ratings have enabled many governments, even those with former debt default, to gain access to international bond markets. Agencies interpret their sovereign credit ratings as forward- looking indications of the relative risk that a sovereign debt issuer will not have the ability and willingness to make full and timely payments of principal and interest over the life of a particular rated financial instrument. Sovereign credit risk analysis may be divided into two broad components: economic and political risk. Economic risk covers the government's ability to repay its obligations on time and is a function of both qualitative and quantitative factors. Political risk addresses the sovereign's willingness to repay its outstanding debt on time (Cantor and Packer, 1996).

Some early empirical studies support the viewpoint that ratings do not provide any additional information, therefore the announcement of rating changes should not cause any abnormal market reaction. Weinstein (1977) examines monthly bond returns, and finds no significant price reaction during the month of the change, six months prior and after the change. Similarly, insignificant price reactions are found by Wakeman (1978), using weekly bond returns and monthly stock returns, as well as Pinches and Singleton (1978) using monthly stock returns.

In contrast, a number of studies support that rating agencies provide information to the market. Griffin and Sanvicente (1982), using monthly data, were the first ones to find evidence of significant negative stock price reaction to rating downgrades while they find no evidence of significant reaction to rating upgrades. Holthausen and Leftwich (1986) is the first paper that used daily data to study the stock price reaction to credit rating changes. They find that rating downgrades by Moody's and Standard and Poor's provide information to the markets and impose costs to the firm by reducing the stock price, while they failed to find a significant stock price reaction for rating upgrades. Hand et al. (1992) find negative abnormal stock returns immediately after a review for downgrade or a downgrade announcement, but no effects for upgrades or positive reviews.

Barron et al. (1997) use UK data and confirm that only bond rating downgrades provide additional information to the equity market. Dichev and Piotroski (2001) investigate long run returns following bond rating changes, and find significant negative reaction to downgrades while in the case of upgrades the reaction was insignificant. Further, they document poorer returns for downgrades of small and low-credit-quality firms. Elayan et al. (2003) find negative reaction to downgrades, but also significant positive reaction to upgrades. Nayar and Rozeff (1994) find results for commercial paper that are similar to previous studies of bond ratings, i.e., statistically significant negative stock price reactions to rating downgrades, but not to rating upgrades.

Goh and Ederington (1993) looked further into the reaction to rating downgrades by analyzing if a bond rating downgrade conveys good or bad news for stockholders.[5] Goh and Ederington (1999) analyze the cross sectional variation in the stock market reaction to bond rating changes, showing that stock markets react more negative to bond rating downgrades within and into junk status. They also find that downgrades tend to follow periods of negative returns, which is interpreted as evidence of partial predictability in ratings. Richards and Deddouche (1999) analyse the effect of rating changes for banks in emerging markets and conclude that stock prices do not respond or respond counter intuitively to announcements of rating changes. Finally, Hull et al. (2004) analyze the relation between credit default swap spreads and credit ratings, finding that only reviews for downgrades convey information to default swaps.

For sovereign ratings, the results are more mixed. Cantor and Packer (1995, 1996) studied the effect of rating announcements by Standard and Poor's and Moody's, finding that an announcement of a change in sovereign risk assessment appears to be preceded by a similar change in the markets' assessment, using a sample of 49 countries. After the announcement, statistically significant bond yield movements in the expected direction follow positive announcements in the agencies' ratings, but negative changes do not produce significant effects. Rating announcements also have a highly significant impact on spreads of speculative grade sovereign bonds but not for investment-grade sovereign bonds, with an announcement by Moody's having a higher impact than announcements by Standard & Poor's. After conducting a variety of cross-sectional analyses, they concluded that ratings subsume all relevant macroeconomic information.

Reisen and von Maltzan (1999) find that a significant change in the yield spread occurred during the announcement period only when a downgrade was implemented, while the announcement effect for emerging market sovereign spreads was largest. Sy (2003) concludes that ratings do not predict currency crises and react ex-post to them, consistent with rating agencies' assertion that they measure probability of debt default and not probability of currency crises. Brooks et al. (2004) studied the aggregate stock market impact of sovereign rating changes from several rating agencies, concluding that national stock markets react to news of sovereign downgrades but not to sovereign upgrades. In addition, the results indicate that there is no equal reaction to sovereign rating changes by rating agencies and multiple downgrades do not appear to impart an additional wealth effect on country markets.[6]

3. Empirical specification

As discussed above, the limited evidence regarding market reaction to the assignment of a sovereign rating is mixed as to whether it provides new information. There are two types of tests employed in this study. First, a traditional event study method is used to examine whether sovereign ratings generate abnormal excess returns. Second, an empirical model is used to provide evidence on the determinants of the announcement-period bank returns.

In this paper, we are interested in the stock price reaction of banks when news of a sovereign rating change is made public. Following Brown and Warner (1985), the null of event studies is that there should be no significant abnormal average returns if the event is uncorrelated with the stock return. The market model is used to estimate the abnormal security returns associated with sovereign rating announcements. We will compute abnormal returns according to the following specification:

$$A_{it} = R_{it} - \hat{a}_i - \hat{\beta}_i R_{mt} \tag{1}$$

Where $\hat{a}_i$ and $\hat{\beta}_i$ are the Ordinary-Least-Square (OLS) parameters obtained from the estimation window (t-240, t-30) relative to the announcement day (t=0), Ait is the abnormal return for bank i, Rit is the return for bank i, and Rmt is the market return.

Once appropriate events were identified, we obtained daily stock data for 240 trading days before the sovereign ratings change and 40 days after. Averaging the abnormal returns over each day in the event period generates average abnormal returns (AAR) as well as the cumulative average abnormal returns (CAAR):

$$AAR_t = \frac{1}{n}\sum_{i=1}^{n} A_{it} \tag{2}$$

$$CAAR_{t1,t2} = \sum_{i=t1}^{t2} AAR_t \tag{3}$$

In order to test the significance of the average abnormal returns in the event window, we use the standard deviation of the abnormal return in the estimation window. Under the assumption of independent and identically (i.i.d.) normally distributed abnormal returns, the ratio of the average abnormal return to the standard deviation is distributed as a Student's t with n degrees of freedom.[8] A cumulative average abnormal return ($CAAR_{t1\text{-}t2}$) is computed as a sum over several event days; i.e., accumulating from day t1 to t2 inclusive. The event-study methodology allows us to study the effect of an upgrade or downgrade on the evolution of spreads around the event.

We also use cumulative abnormal returns (CAR) over event window as dependent variables in regressions against selected possible determinants of the market's reaction.

$$CAR_{t1,t2} = a + b_1 rating + b_2\, x_{it} + b_3 m_t + u_{it} \tag{4}$$

where cumulative abnormal returns, CAR; is written as a function of ratings; a vector of bank-level variables reflecting the characteristics of each bank, x; variables that reflect macroeconomic conditions, m; and the error term u. In what follows, we discuss in detail our variables.

Although the individual agencies' ratings are measured on different scales, there are very broad similarities between them. In order to get appropriate data to implement empirical estimations, it is necessary to perform a numerical transformation of the rating notches into numbers. Therefore, we construct a variable that takes numeric values between

1 and 16, defined according to the notation levels of the three rating agencies, using a linear transformation. A detailed presentation is given in Table 1.

positor trust, especially in developing countries or in periods of financial crisis (Demirgüç-Kunt and Huizinga, 1999; Demirgüç-Kunt et al., 2004).

Table 1
Rating symbols for long-term debt

Interpretation	Moody's	Standard and Poor's	Fitch	Linear Transformation
Highest quality	Aaa	AAA	AAA	16
High Quality	Aa1	AA+	AA+	15
	Aa2	AA	AA	14
	Aa3	AA-	AA-	13
Strong payment capacity	A1	A+	A+	12
	A2	A	A	11
	A3	A-	A-	10
Adequate payment capacity	Baa1	BBB+	BBB+	9
	Baa2	BBB	BBB	8
	Baa3	BBB-	BBB-	7
Likely to fulfil obligations, ongoing uncertainty	Ba1	BB+	BB+	6
	Ba2	BB	BB	5
	Ba3	BB-	BB-	4
High-risk obligations	B1	B+	B+	3
	B2	B	B	2
	B3	B-	B-	1

Note: In our sample, the agencies have not assigned sovereign ratings below B3/B-.
Source: Cantor and Packer (1994)

Moreover, we include a number of bank-specific control variables. Leverage (capital adequacy) is proxied by the ratio of equity to assets (EA) and serves as an indicator for the risk of insolvency and the market value of assets (Maudos and Fernández de Guevara, 2004). Capital represents the amount of own funds available to support a bank's activities and acts as safety net in the case of adverse developments. Indeed, the insolvency risk affects firm's income through the risk premium that the bank has to pay in order to borrow funds. This issue is particular important for transition economies where the insolvency risk of banks can be particularly great, due to the high proportion of non-performing loans in loan portfolios. Banks with considerable capital adequacy are facing lower risk of bankruptcy, while holding capital in excess is a mean for banks to signal solvency and inspire de-

Portfolio performance captures the bank's capability in matching the needs for deposit and loan services and is measured by the loans to assets ratio (LA). Bank loans are naturally the main source of income, being the most risky and having the highest yield (in terms of expected return) among bank assets as well as the highest operational costs, as they need to be originated, serviced and monitored. Credit risk (a bank's quality of assets) is measured by the ratio of loan loss provisions to loans (LLP) and refers to the uncertainty associated with loan repayment. In anticipation of some borrowers' defaulting, banks set aside part of their earnings through an expense account called provision for loan losses, in attempting to cover such contingencies. In effect, bank capital or earnings (the loan loss expense provision) are reserved for future loan losses. Because most of bank earning assets are in the form of loans, problems with loan quality have been the major cause of bank failure. Symptoms of poor loan quality include high levels of non-performing loans and loan losses. A high proportion of loan provisions relative to loan assets and rapid growth of the loan portfolio are potential early-warning signals of loan-quality problems, which may indicate potential failure.

Liquidity risk is proxied by the liquid assets to total assets ratio (LIQ).[9] Liquidity risk is the variation in net income and market value of equity caused by a bank's difficulty in obtaining cash at reasonable cost from either the sale of assets or new borrowings. Liquidity is generally discussed in terms of assets, with reference to an owner's ability to convert the asset to cash with minimum loss from price depreciation. Most banks hold some assets that can be readily sold near par to meet liquidity needs. The problem arises because of a shortage of liquid assets or because the bank is unable to raise cash on the retail or wholesale markets. Liquidity risk is greater when a bank cannot anticipate new loan demand or deposit withdrawals and does not have access to new sources of cash.

In addition, we employ the logarithm of total assets (SIZE) to capture the effect of bank size. First of all, size can in itself entail a reduction in the cost of obtaining resources (deposits or borrowing) if there is a reputation ("too big to fail") effect, as larger banks may `be seen by customers as safer and may thus benefit from a lower cost of external resources.

In relation to the function of banks as providers of liquidity to their customers, size entails a reduction in costs insofar as it may offer better diversification opportunities in the deposit base as well as investment and loans, and therefore it reduces the likelihood of a liquidity shortage. Moreover, small banks are assumed to suffer from informational asymmetry problems more than large banks do. Whereas, for banks that become extremely large, the effect of size could be negative due to bureaucratic or other reasons.

To examine the impact of banking sector reform we use the European Bank for Reconstruction and Development (EBRD) index of banking sector reform. The EBRD index[10] of banking sector reform has been compiled with the primary purpose of assessing the progress of the banking sectors of formally centrally planned economies. This will enable us to assess how the changes in regulation of the last decade (such as financial and bank reform, financial market liberalization, the implementation of prudential regulation) have affected bank returns.[11] As this indicator quantifies and qualifies the degree of liberalization of the banking industry, it is suitable for an explicit evaluation of the effect of banking sector reform on the performance of banks (see also Claeys and Vander Vennet, 2007). The reform scores of EBRD range from 1.0 to 4.0+, with 1.0 indicating a rigid centralized economy and 4.0+ implying the highest level of reform, which corresponds to a fully industrialized market economy.

To capture the effect of the macroeconomic environment we use GDP growth (GDP) and inflation (INF). Demirgüç-Kunt and Huizinga (1999) and Demirgüç-Kunt et al. (2004) suggest that GDP per capita serves as a general indicator of economic development by reflecting differences in banking technology, the mix of banking opportunities and any aspects of banking regulations. In contrast, low GDP per capita weakens the debt servicing capacity of domestic borrowers and contributes to an increase of credit risk. High inflation rates are generally associated with high loan interest rates. However, high inflation may also be viewed as a proxy for poor macroeconomic performance and stability, which makes the accurate assessment of credit and market risks more difficult. Moreover, a high rate of inflation points to structural problems in the government's finances. When a government appears unable or unwilling to pay for current budgetary expenses through taxes or debt issuance, it must resort to inflationary money finance, while public dissatisfaction with inflation may in turn lead to political instability.

4. Data

Our dataset includes information on the banking sectors of thirteen transition countries, namely Bulgaria, Croatia, Czech Republic, Estonia, FYROM, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and Ukraine, for the period 2000-2009. The particular sample period is chosen in an effort to examine the influence of sovereign ratings launched in these countries. All bank-level data are obtained from the Fitch–IBCA Bankscope database, the macroeconomic variables from the IMF's International Financial Statistics and the banking reform index from the European Bank for Reconstruction and Development. The Bankscope database reports financial statements from banking institutions worldwide that are homogenized into a global format and, therefore, suitable for a cross-country study. After reviewing the data for reporting errors and other inconsistencies, we end up with a panel of 96 banks, which comprises a large portion of banks in terms of the number and of the assets of financial institutions operating in the Central and Eastern European countries.

Daily stock data for the banking sector is collected from Bankscope and Datastream, while information available on sovereign rating from the world's three leading international credit rating agencies, Standard & Poor's (S&P), Moody's Investors Services (Moody's) and Fitch-IBCA (Fitch), is from Bloomberg. To build up a sufficient sample size, it is mandatory for us to combine data from three rating agencies and many different emerging markets. Announcements of sovereign ratings were collected from 2000 to 2009. Although they employ different scales, credit ratings for long-term debt are broadly comparable across rating agencies. For S&P and Fitch, the scale extends from AAA (extremely strong capacity to repay) to D (default). For Moody's ratings, the highest rating attainable is Aaa (extremely high capacity to repay), with the scale extending up to C (default).

Bloomberg was also used to identify any confounding events around the announcement date, specifically in the three-day window (from one day before, to one day after, the announcement date). All banks included in the final sample have no other confounding announcements occurred within the three-day window from one day before, to one day after the announcement date of the sovereign rating. This distinction is important when considering an event window, in order to be able to isolate the effect of each sovereign rating change. Announcements that occurred simultaneously with the release of other bank-specific information are segregated from announcements that did not occur simultaneously with the release of other bank-specific information. If important financial events concerning a bank are reported to investors, a change in prices may be incorrectly attributed to the rating agency. Daily returns are available for the period of 240 days before, to 40 days after the announcement date. Table 2 provides a breakdown by ratings of assignment. The breakdown of the action announcements shows that there are 25 downgrades, 34 upgrades, and 45 rating affirmations.

Sovereign ratings by Standard and Poor's, Moody's and Fitch

Country	Standard and Poor's		Moody's		Fitch	
	Max. rating	Min. rating	Max. rating	Min. rating	Max. rating	Min. rating
Bulgaria	BBB+	B+	Baa3	B3	BBB	BBB-
Croatia	BBB+	BBB-	Baa3	Baa3	BBB	BBB-
Czech Republic	A	BBB	A1	Baa1	AA-	A+
Estonia	A	A-	A1	A1	A-	A-
FYROM	BB+	BB			BB+	BB+
Hungary	A-	BB+	A1	Ba1	BBB+	BBB
Latvia	A-	BB	Baa3	Baa3	BBB-	BB+
Lithuania	A	BBB-	Baa1	Baa1	BBB	BBB+
Poland	A-	BB+	A2	Baa3	A	A-
Romania	BBB-	B	Baa3	Baa3	BBB-	BB+
Slovakia	A+	BB-	A1	Ba1	A+	A+
Slovenia	AA	A	Aa2	Aa2	AA	AA
Ukraine	B	B	B2	B1	B-	B-

Note: This table shows a breakdown of sovereign rating changes issued by Standard and Poor's, Moody's and Fitch. Standard and Poor's uses 24 different categories, going from D (lowest) to AAA (highest), with a "+" or "-" to denote issuers above or below the mean in each category. Moody's has 27 categories, ranging from a lowest rating of C to a highest rating of Aaa. Moody's adds the number 1, 2, or 3 after the rating to signal an issuer above the mean, on the mean or below the mean in each category, respectively. Fitch uses 24 different categories, going from D (lowest) to AAA (highest), with a "+" or "-" to denote issuers above or below the mean in each category. Max and min ratings are the highest and lowest qualifications issued to that country from 2000 to 2009.

5. Estimation and results

This paper is the first to study the effect of sovereign credit changes on the stock prices of domestic banks. After computing abnormal returns for each firm, we run cross-sectional regressions of those abnormal returns on bank-specific characteristics and country-specific variables.

There are two alternative views about the informational value of the agencies' credit ratings. One view is that credit rating agencies only have access to publicly available information and that the agencies generally lag the financial markets in processing that information (see Gropp and Richards, 2001). According to this argumentation, rating changes should not affect market prices if financial markets are efficient in semi-strong form. An alternative view is that credit rating agencies are specialists at obtaining and processing information, and thereby generate information on issuers' default risk previously not available in financial markets that could induce institutional investors to rebalance their portfolios for risk management, liquidity and other reasons. This rating effect is likely to be stronger in emerging markets, where problems of asymmetric information and transparency are more severe.

This paper uses event study with daily data surrounding press release dates to examine abnormal returns of the bank stock prices due to sovereign credit ratings. Our first concern involves estimating daily average abnormal preferred stock returns (AAR) and cumulative average abnormal stock returns (CAAR) for upgrade ratings, downgrades as well as affirmative ratings. The event study results for the 104 announcements of sovereign rating assignments are shown in Tables 3 and 4.

The average abnormal returns (AAR) as well as t-statistics are reported from three days before (t-3), to three days after (+3) the announcement date (Table 3). A crucial parameter that is related to the efficient market hypothesis and differentiates the empirical results, is the duration of the event windows on which the abnormal returns are calculated (see also Lyroudi et al., 1999; Papadopoulos et al., 2008). The event window is defined somewhat wider than just 1 day because there is no exact information available on the announcement time of the rating action by the agencies. Hence, it is not possible to determine whether the announcement was made during trading or after trading on a given day. We examine abnormal returns separately for downgrades, upgrades and affirmative ratings using the announcement date (t = 0), and days (-3 to +3). Mean abnormal returns (AAR) and their statistics for these days are reported in Table 3. The 25 downgrades have mean abnormal returns ranging from -0.007 for day -3 to -0.013 for day –1, significant at the 1% level. The return in day +3 is also negative, although statistically significant at 10%. For upgrades, the 34 events have mean abnormal returns ranging from 0.028 to 0.001, and none is significant at conventional levels. In the case of affirmative rating we observe significant abnormal return for the date of the announcement at 5% level, while in all other days abnormal returns are insignificant. Possible explanations for significant abnormal returns in the case of negative events (and not for positive events) are, for example, information-processing biases (see Dichev and Piotroski, 2001), or a disciplinary effect on the firm's management (see Vassalou and Xing, 2003).

Table 3
Daily abnormal returns

	Affirmation		Downgrades		Upgrades	
Trading days	Average Abnormal return	t-statistic	Average Abnormal return	t-statistic	Average Abnormal return	t-statistic
-3	-0.026	-1.45	-0.007	-2.69***	0.003	0.92
-2	-0.021	-1.14	-0.012	-3.12***	0.002	1.52
-1	0.007	2.14	-0.013	-2.89***	0.012	1.34
0	0.005	1.59**	-0.002	-2.03**	0.015	1.37
+1	0.004	1.52	0.003	1.02	0.028	1.32
+2	-0.001	-1.52	0.006	1.04	0.012	1.04
+3	-0.012	-1.45	-0.013	-1.82*	0.001	1.37

Note: This table presents results from an event study analysis. Returns were computed using the market model and a (t-240, t-30) estimation window. The t-statistic is computed as the ratio of the mean abnormal return to the estimated standard deviation from the time series of mean abnormal returns. The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively.

Cumulative returns are also provided for various time windows (Table 4). Six windows are used, each for the 29 trading days before and after the announcement as well as a three-day window (day –1 to day 1) around the announcement date. Both upgrades and downgrades are reported separately. The results for the 45 announcements of an affirmed rating show insignificant CAAR for all windows. This suggests that a sovereign rating assignment is neither a uniformly good or bad news event. These findings support the hypothesis that the announcement of an affirmative sovereign rating assignment provides information not associated with a significant abnormal market reaction. Table 4 also summarizes the event study output for the 25 announcements of a rating downgrade. The three-day CAAR is -0.016, which is statistically significant at the 1% level. The results support that announcements of sovereign rating downgrades are expected to be associated with a significantly negative abnormal market reaction. This result is consistent with previous studies like Holthausen and Leftwich (1986), Hand et al. (1992), Nayar and Rozeff (1994), and Elayan et al. (2003).

In the case of the 34 announcements of a rating upgrade, all event windows are insignificant. The results support that the announcement of sovereign rating upgrades should be associated with a positive, but insignificant abnormal market reaction. These (essentially) insignificant results for positive action announcements are consistent with previous studies. This finding supports the hypothesis suggested by Schweitzer et al. (1992) that the reputation of rating agencies may depend more on the early recognition of deterioration than the improvement of a company's, or a country's in the case of sovereign ratings, financial condition. Moreover, our results are in line with most other studies using stock market data finding a significant price response to downgrades but not to upgrades (Goh and Ederington, 1993). The results are also consistent with Griffin and Sanvicente (1982) who find a significant negative price response for downgrades using monthly stock return data. In particular, our results, compared with mature markets, highlight the information asymmetry especially in the case of banks in emerging markets.

Table 4
Cumulative abnormal returns on a specific event window

	Affirmation		Downgrades		Upgrades	
Trading days	Cumulative abnormal return	t-statistic	Cumulative abnormal return	t-statistic	Cumulative abnormal return	t-statistic
-30 to -21	-0.045	-0.945	-0.014	-1.57	0.012	1.45
-20 to -11	-0.037	-1.13	-0.001	-1.41	0.014	1.52
-10 to -2	-0.017	-1.54	-0.007	-1.69*	0.021	1.21
-1 to +1	0.015	1.59	-0.016	-3.17***	0.020	1.14
+2 to +10	-0.004	-1.32	0.001	1.54	0.032	1.25
+11 to +20	-0.003	-1.42	0.004	1.07	0.017	1.04
+21 to +30	-0.011	-1.49	0.012	1.56	0.003	1.09

Note: This table presents results from an event study analysis. Returns were computed using the market model and a (t-240, t-30) estimation window. The t-statistic is computed as the ratio of the mean abnormal return to the estimated standard deviation from the time series of mean abnormal returns. The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively.

In addition, different models are used to examine the determinants of cumulative abnormal returns (CAR). In these regressions the dependent variable is several windows of CAR. Table 5 provides the determinants that attempt to explain different windows of CAR around a sovereign downgrade. The results for EA show that banks with increased capital experience less reaction especially for the window [-1 to +1]. This finding is consistent with the interpretation that capital serves as a signal of the banks' creditworthiness in Central and Eastern Europe's bank markets. The impact of LA as well as LIQ seems to be insignificant.

On the other hand, higher provisions generate a less negative response. It is to be expected that firms specialising in the granting of loans are more exposed to credit risk, showing that the Central and Eastern European banks should focus more on credit risk management, which has been proved problematic in the recent past. Serious banking problems have arisen from the failure of banks to recognise impaired assets and create reserves for writing-off these assets. An immense help towards smoothing these anomalies would be provided by improving the transparency of the financial systems, which in turn will assist banks to evaluate credit risk more effectively and avoid problems associated with hazardous exposure.

For downgrades the SIZE variable is always significant at 1% level. Therefore, this result suggests that a rating downgrade generates a higher reaction for smaller banks (Dichev and Piotroski, 2001). Large banks are usually followed by large group of investors, which will reduce information asymmetry.[12] Therefore the market reaction associated with large firms should be less strong than for smaller ones. In all cases, countries with higher GDP seem to react less in downgrades. In the same line, the results indicate that a higher value of EBRD reduces the reaction of downgrades in more stable banking systems. Finally, as it concerns the influence of rating, sovereign downgrades in lower levels cause higher negative reactions. However, the adjusted R-squares indicate high explanatory power for the overall regressions.

Table 5
Regression results of cumulative abnormal returns on a specific event window surrounding announcements of initial ratings (downgrades)

Dep var:CAR	-20 to -11	-10 to -2	-1 to +1	+2 to +10	+11 to +20	+21 to +30
rating	-0.154	-0.157	0.172**	0.178**	0.179**	-0.110
EA	0.254*	0.204**	0.229***	0.249**	0.252**	0.231*
LA	-0.306	-0.305	-0.296	-0.282	-0.292	-0.258
LLP	0.031*	0.031**	0.024**	0.024**	0.022**	0.008**
LIQ	0.052	0.052	0.048	0.051	0.052	0.053
SIZE	0.054***	0.054***	0.054***	0.050***	0.050***	0.049***
GDP	-0.042	0.043**	0.063**	0.023**	0.027	0.029
INF	-0.029	-0.029	-0.029	-0.020	-0.027	-0.023
EBRD	0.253*	0.256*	0.352**	0.253*	0.256**	0.352*
Intercept	-1.977	-0.756***	-1.454	-0.693***	1.874	1.109
R^2 with	0.41	0.41	0.42	0.42	0.42	0.43
R^2 betw	0.43	0.43	0.42	0.44	0.44	0.42
R^2 overall	0.45	0.45	0.45	0.45	0.45	0.45
Wald test	411.62	494.70	345.75	500.69	406.47	355.70

Note: CAR: Cumulative Abnormal Return; EA: equity / total assets; LA: loans / total assets; LLP: loss loan provisions / loans; LIQ: liquid assets/total assets; GDP: annual % GDP growth; INF: inflation rate; EBRD: EBRD index on banking reform. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request. The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively.

Table 6 presents the determinants of CAR for several windows during an upgrade announcement. Although the index-level results did not produce significant abnormal returns, this does not mean that there is not information in the cross section (see also Elayan et al., 2003). The EA turns out to be significant at 5% level for the windows closer to the announcement date. This result suggests that investors have a higher reaction when banks with less capital are upgraded, finding the rating upgrade more informative. Moreover, banks in countries with lower level of banking sector reform seem to react more positive in an upgrade announcement. GDP growth plays a crucial role, pointing that less developed economies react stronger to positive announcements. As it concerns rating classes, the results suggest that investors are less impressed when firms with an upgrade into a higher class are upgraded. Finally, larger banks do not experience larger increases when a sovereign upgrade is announced.

a country lessens the abnormal returns. Furthermore, banks located in countries with more developed financial markets experience smaller gains following affirmative announcements. Banks with more loans as a proportion of total assets benefit more from a sovereign announcement. Finally, the influence of rating class is considerably important as an affirmation of higher rating forces an increase in abnormal returns.

Table 6
Regression results of cumulative abnormal returns on a specific event window surrounding announcements of initial ratings (upgrades)

Dep var:CAR	-20 to -11	-10 to -2	-1 to +1	+2 to +10	+11 to +20	+21 to +30
rating	-0.145*	-0.167*	-0.187**	-0.167*	-0.004	-0.012
EA	0.276	-0.223**	-0.214***	-0.219***	0.212	0.201
LA	0.006	0.005	0.006	0.005	0.005	0.005
LLP	0.012	0.012	0.014	0.011	0.012	0.013
LIQ	0.011	0.011	0.014	0.014	0.012	0.008
SIZE	-0.074*	-0.064*	-0.064***	-0.059**	-0.062	-0.058
GDP	-0.078**	-0.073**	-0.082***	-0.083**	-0.077*	-0.079*
INF	-0.019	-0.013	-0.014	-0.020	-0.017	-0.013
EBRD	-0.053	-0.069***	-0.063***	-0.053*	-0.056*	-0.052*
Intercept	-0.877	0.496***	0.267	0.767***	0.456	0.109
R^2 with	0.45	0.45	0.43	0.49	0.44	0.43
R^2 betw	0.49	0.44	0.43	0.49	0.44	0.42
R^2 overall	0.51	0.49	0.48	0.55	0.51	0.49
Wald test	434.62	499.80	445.00	512.09	467.07	455.70

Note: CAR: Cumulative Abnormal Return; EA: equity / total assets; LA: loans / total assets; LLP: loss loan provisions / loans; LIQ: liquid assets/total assets; GDP: annual % GDP growth; INF: inflation rate; EBRD: EBRD index on banking reform. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request. The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively.

Table 7 presents the models in the case of affirmative announcements. No systematic relationship between abnormal returns and size as well as credit risk is evident in our sample. The reaction after an announcement of an affirmative sovereign rating seems to be influenced by the GDP growth, pointing that the higher economic performance of

Table 7
Regression results of cumulative abnormal returns on a specific event window surrounding announcements of initial ratings (affirmative)

Dep var:CAR	-20 to -11	-10 to -2	-1 to +1	+2 to +10	+11 to +20	+21 to +30
rating	0.165*	0.167*	0.172***	0.154**	0.145*	0.002
EA	0.104	0.003	0.002	0.023	0.052	0.001
LA	0.316***	0.315***	0.316***	0.382***	0.342***	0.358***
LLP	0.002	0.002	-0.040	-0.051	-0.052	-0.053
LIQ	0.001	0.001	0.004	0.004	0.002	0.008
SIZE	0.004	0.004	0.004	0.050	0.005	0.009
GDP	-0.442*	-0.403*	-0.463**	-0.423**	-0.427**	-0.429**
INF	-0.009	-0.009	-0.009	-0.009	-0.007	-0.003
EBRD	-0.143**	-0.125**	-0.152**	-0.153**	-0.156**	-0.152**
Intercept	-0.077	-0.056**	-0.404	0.603	0.874	0.109
R^2 with	0.46	0.51	0.52	0.52	0.52	0.53
R^2 betw	0.49	0.53	0.52	0.54	0.54	0.52
R^2 overall	0.52	0.55	0.55	0.55	0.55	0.55
Wald test	498.98	574.70	445.75	567.87	456.47	455.70

Note: CAR: Cumulative Abnormal Return; EA: equity / total assets; LA: loans / total assets; LLP: loss loan provisions / loans; LIQ: liquid assets/total assets; GDP: annual % GDP growth; INF: inflation rate; EBRD: EBRD index on banking reform. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request. The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively.

6. Main Conclusions

In this paper we analyzed the impact and determinants of sovereign ratings especially in emerging markets. Central and Eastern Europe's (CEE) banking systems consist a unique political-economic case to investigate sovereign credit rating changes and their impact on stock price returns. The traditional event study methodology was used in examining whether and how banking stock markets respond to sovereign rating announcements by the three major rating agencies (Standard & Poor's, Moody's and Fitch). These results imply that upgrade and affirm ratings do not have a significant effect on stock market returns, while market reacts negatively only to a downgrade announcement.

In addition, concerning the determinants of stock price reaction around the announcement date of a sovereign rating change, it was found that smaller banks experience larger stock price drops after a sovereign credit downgrade, while they experience larger increases in the case of a sovereign upgrade. Also, the banks in poorer emerging countries with less developed banking sectors, experience larger drops in the price of their shares. As it concerns rating classes, the results suggest that investors are less impressed when firms with an upgrade into a higher class are upgraded, while sovereign downgrades in lower levels cause higher negative reactions.

In the framework of the 'identification problem', further future study is awaiting for the behavior of the international credit rating agencies, in view of their power and function in reducing 'asymmetric information' to avoid adverse selection and moral hazard; because distortions, possible destabilization and distress at local financial markets can have side effects to the financial and real sector functioning, worldwide. This problem has structural nature and is related with the possible future reform of the international monetary system.

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Appendix I
Summary of the literature on measuring credit ratings

Authors	Data	Results
Griffin and Sanvicente (1982)	1960–1975, Moody's and S&P, 180 rating changes, monthly abnormal stock returns during [-11, 1]	No anticipation but negative reaction after downgrades
Holthausen and Leftwich (1986)	1977–1982, Moody's and S&P, 1014 rating changes, 256 additions to S&P Credit Watch, daily abnormal stock returns during [-300, 60]	Significantly negative reaction after downgrades, no significant abnormal performance for upgrades
Glascock et al. (1987)	1977–1981, Moody's, 162 rating changes, daily abnormal stock returns during [-90, 90]	Significantly negative abnormal stock returns before and around downgrades
Hand et al. (1992)	1977–1982/1981–1983, Moody's and S&P, 1100 rating changes and 250 additions to S&P Credit Watch, window spanning stock and bond returns	Significantly negative abnormal stock and bond returns for downgrades, no significant abnormal returns for upgrades
Goh and Ederington (1993)	1984–1986, Moody's, daily abnormal stock returns during [-30, 30]	Significantly negative returns for downgrades, positive abnormal returns for downgrades
Dichev and Piotroski (2001)	1970–1997, Moody's, 4727 rating changes, daily abnormal stock returns	Significantly negative returns during the first month after a downgrade, no significant reaction for upgrades

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1. Comparing the banking sector in the countries under review (measured by domestic credit in proportion to GDP) with the size of the financial market (using stock market capitalization to GDP) reveals the importance of the banking sector.

2. The geopolitical term includes Bulgaria, Croatia, Czech Republic, Estonia, FYROM, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and Ukraine.

3. See also Kalyvas et al. (2007) for a thorough analysis if the riskiness in South and Eastern European markets.

4. Among those agencies assigning sovereign ratings, the best known include Standard and Poor's Corporation, Fitch and Moody's Investors Service. The main criteria used include the characteristics of a political system, executive leadership, government institutions, social coalitions, social indicators, and external relations as well as demographic characteristics, structure of the economy, recent economic trends, and economic policy. Moody's (1996) divides the factors which influence the determination of the overall sovereign credit rating into eight categories: political risk, income and economic structure, economic growth prospects, fiscal flexibility, public debt burden, price stability, balance of payments' flexibility, and external debt and liquidity.

5. The findings of significant rating change effect by more recent studies may be attributed to the use of more powerful statistical methodologies, as well as more accurate data (e.g., daily returns) employed. Studies that document a significant rating change effect, however, find that the effect exists only for rating downgrades, not for upgrades. An argument initially put forth by Holthausen and Leftwich (1986) based on a Merton-model for firm value point of view suggest that equity holders hold an option on the value of the firm with an exercise price equal to the par value of the firm's debt, and therefore an increase in the variance of the firm's cash flows would trigger a downgrade and redistribute wealth from bondholders to stockholders.

6. For a brief review of related studies see Appendix I.

7. We include country dummies to control for country fixed effects, although for brevity we do not report the results of each intercept.

8. It should be emphasized that the reported results are not sensitive to the definition of expected return. Tests using alternative definitions of expected return, as described in Stickel (1985), did not alter any conclusions.

9. This is a deposit run off ratio that indicates what percentage of customer and short-term funds could be met if they were withdrawn suddenly. Therefore the higher this percentage the more liquid the bank is and less vulnerable to a classic run on the bank.

10. The EBRD uses the number of banks (and the share of foreign owned banks), the asset share of state- owned banks, the percentage of bad loans, credit to the private sector and stock market capitalization (EBRD, 2001).

11. In this study, we introduce the EBRD index of banking system reform in the Central and Eastern European countries to identify the progress in areas such as: i) the adoption of regulations according to international standards and practices, ii) the implementation of higher and more efficient supervision, iii) the privatisation of state-owned banks and iv) the write-off of non-performing loans and the closure of insolvent banks.

12. In the same vain, Pasiouras et al. (2006) show that larger and more profitable banks tend to obtain higher individual ratings.

The Need of Identifying Heuristic Measures of Entrepreneurship

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In this paper we will present the idea of some new heuristic method that will help responsible understand at a glance whether a written text, presented to them has been written by a person who can potentially become a successful entrepreneur or not. We strongly believe that entrepreneurship will help Greece overcome the fiscal crisis it is currently suffering, so we are working on the direction of exploring the need to identify measures of the potential entrepreneur's qualities as they are reflected in their written texts.

Keywords: Entrepreneurship, Leadership, Strategy, Heuristic Measures

Jel: L26, M10, O32, C38

1. Introduction

Entrepreneurship is considered as a catalyst for value creation. Entrepreneurs are the ones to play a significant role both as far as it concerns existing and new markets, since they will foster changes or identify and create new markets [7]. The question is whether entrepreneurship can lead Greece to overcome the fiscal crisis. How can this happen? What are the characteristics one should search for in the potential entrepreneur's character to explore the degree to which a business plan can be reliable enough, in terms of the potential businessman's character? And, above all, how can those characteristics be sought for? Are there any safe methods? How can banks and officers be sure that their money will be invested as safely as possible on new innovative ideas?

In this paper, we explore the need for heuristic methods which will help us to find out a person's qualities from his written texts. Section 2 of the paper is describing the expected potential businessman's qualities. In Section 3 we describe the suggested way to measure entrepreneurship in texts, while in Section 4, we present a more holistic and systemic view of entrepreneurship, in relation with leadership and strategy. Finally, Section 5 concludes the paper.

2. Entrepreneurship

In order to explore the degree of entrepreneurship hidden in written texts, one should use the definition of an entrepreneur and the qualities he is expected to possess.

According to the business dictionary [18] an entrepreneur is "someone who exercises initiative by organizing a venture to take benefit of an opportunity and, as the decision maker, decides what, how, and how much of a good or service will be produced".

Additionally, the successful entrepreneur is considered to be like a dreamer, imagining the future he would like to have and working hard in order to make sure that his dreams will become true. That is the reason why the entrepreneur's role in society is considered to be very important.[30]

So, we can see the following qualities that should be explored in any potential entrepreneur:

(a) exercise of initiative,

(b) ability to make decisions in order to undertake beneficial activities,

(c) being a dreamer,

(d) being a hard worker.

Additionally, one can easily understand that the potential entrepreneur should

(e) possess a strong eye on social, political and economic issues.

Schumpeter was one of the economists who have discussed about entrepreneurship. Actually, he claimed that entrepreneurs are people who: (1) are self-reliant and self-confident, (2) looking eagerly to be excellent, (3) the fact that they undertake the entrepreneurship activities show persons who are really optimistic. Finally, according to Schumpeter, the entrepreneur is a person that (4) would not really undertake very risky challenges. He would prefer something which is of medium difficulty and risk so as to avoid being ruined as much as possible. [19], [11], [20],[10],[12].

So we can see that the qualities mentioned in the previous paragraph, now can be further enriched by:

(f) self-reliant

(g) self-confident

(h) looking forward to excellence

(i) optimistic

(j) risky but no too much

Obviously, what is very important for a person that wants to undertake an enterprising activity is to have concrete and measurable plans and be aware of the corresponding risks, as well as of ways to overcome any potential obstacles. Some of the qualities needed are not to fear and to be decisive and optimistic [18]

Concluding with the qualities a potential entrepreneur should possess, we can see that:

(k) courageous

3. Measuring Entrepreneurship

Going back to the fiscal crisis of Greece, "The greater the inconsistencies in existing service and quality, in lead times and in lag times, the greater the vacuums and gaps in information and knowledge, the greater the opportunities." [15]. That means, that an entrepreneur who can recognize the opportunity within the crisis, will have many chances to be successful.So the question now is how one can find out all these qualities in a written text (e.g. a business plan) or a loan application. Obviously, some heuristic method is needed, in order to do so.

Several scientists such as Low and MacMillan [9] researching on entrepreneurship suggested that contextual issues should be also taken under consideration, while Tversky and Kahneman [16] and Stevenson and Gumpert [14] suggest that point out the importance of simplifying heuristics at the point of decision making, since often decisions should be made with little or no historical data at all. [21]

According to the previously stated theoretical criteria for an entrepreneur, we can see that heuristics could be suggested for nearly each one of them, except perhaps, how hard-working the particular person is or willing to be.

3.1 Building the measures of Entrepreneurship

In order to propose measures [2] we use the General Inquirer (GI) [4] software, which maps the text into categories and the measures follow the basic principles of the following three software packages: GI [4], LIWC [8] and DICTION [1]. The measures are constructed, based on Shannon's information theory and are entropic.

We thought that using entropic measures in order to measure a text's attributes, would be more appropriate, because [3]:

(1) We use the GI mapping of the texts. Each of the GI [4] categories includes a piece of information.

(2) The fact that the frequencies of the word categories in a text, tend to differ in a linear manner according to the probabilities' logarithm leads us to the conclusion that entropic measures are more useful. More specifically, we normalise the results given by GI, so as to sum up to one.

(3) It is closer to our intuitive approximation of a proper measure, which is denoted as:

This happens because entropy in the space [0,1] follows a normal distribution, which makes it obvious that the overuse of a certain word category might lead to a counter-effect, such as having results opposite to the expected ones.

Shannon [13] notes that the semantic aspects of communication are irrelevant to the engineering problem and that the significant aspect is that the actual message is one selected from a set of possible messages.

(4) It is broadly used by numerous classification algorithms, e.g. ID3 [17].

3.2 Presentation of the measures of Entrepreneurship

The attitudes for which heuristic measures are already proposed [2], [3] are the following:

(a) Measure of Identity: with which we are supposed to measure the degree of honesty and personal view the person under consideration has on the matters he/she refers to.

(b) Measure of Security – Insecurity: with which we compare the "I-words" against the "we-words", taking under consideration the fact that the use of the Royal We at disproportionately high rates is supposed to be a characteristic of insecure speakers (among which analysts include the politicians).

(c) Certainty (score): with which we are trying to calculate the degree of resoluteness, inflexibility, and completeness and a tendency to speak ex cathedra of the person under consideration.

(d) Positive impression: with the use of this heuristic, we try to calculate the positive impression of a text

(e) Negative impression: with the use of this heuristic, we calculate the negative impression obtained by the reader of the text.

(f) Overall impression: with which we calculate the overall impression (i.e. abstracting the negative impression from the positive one) of the text.

What we need to further measure is the degree of determination and those of the socioeconomic orientation and political thought in order to make sure the particular individual is aware of the risks and challenges he is about to undertake and of all the factors (exogenous or endogenous) that might cause problems.

(g) Determination: which is a heuristic which will help us measure whether the text examined indicates that the particular person is ready to fight for overcoming the potential obstacles in order to achieve his goal.

(h) socioeconomic orientation (score): which will show the degree of awareness of the particular individual about the socioeconomic environment in which he will have to act and do his business. This is about the exogenous factors

(i) political thought (score): which will give a more precise indication of the awareness of the individual about the exogenous factors and the obstacles they might cause

4. Leadership, Entrepreneurship, and Strategy

Leadership, entrepreneurship, and strategy are answering questions about "who," "what," and "how." More specifically, leadership is answering the question: "who helps go forward and which are the good leader's characteristics". Entrepreneurship answers the "what" questions, and the strategic management answers the "how" questions about the right choices and existing opportunities [7].

All the previously mentioned qualities show a person that might have the potential to become an entrepreneur and even to succeed. Still though, none of them reinsures a charisma this person might have. Being a dreamer, does not necessarily mean that a person will be able to lead a business successfully. Leaders have to use their intelligence in order to build their IQ, EQ, and SQ [22]. In order to foster spiritually intelligent leadership, one should be expected to: (a) know what are the things he deeply believes in and values and what deeply motivates him; (b) be able to live in and to be responsive to the moment; (c) to act and live with principles and deep beliefs; (d) be able to see the whole image and recognize larger patterns, relationships, and connections; (e) have a sense of belonging; (f) be characterized by both "feeling-with" and deep empathy; (g) be able to value other people for their differences (h) be able to stand against the crowd and keep his own ideas; (i) Have the sense of being part of the world; (j) Need to understand things and get to the bottom of them; (k) Stand back from a situation or problem and seeing the bigger picture in order to see problems in a wider context; (l) be able to learn and grow from mistakes and any kind of obstacles; (m) feel he has to serve and return things to society.

Leadership is a matter of how to be not how to do it [6]., while Peter Drucker reminds leaders that their job is to release and not to provide energy. It should be defined as the social and informal sources of influence that one uses in order to inspire action taken by others. A leader will be expected to mobilize others in order to struggle toward a common goal, but will avoid using his authority and power when it is not absolutely necessary [7].

4.1 Strategic aspects

Strategy is the art of making choices and strategic management answers questions about the development and implementation of good strategies. Since strategic management is the central, integrated externally-oriented concept of how an organization will achieve its objectives [5], it is considered as one of the most critical principles of management.

5. Conclusion

In this article, we have presented our view that Greece can get through the fiscal crisis, with the use of entrepreneurship. The potential entrepreneurs are the ones who will see the opportunity within the crisis and not be afraid to express and follow their dream. We have searched the need of some heuristics with the use of which, one can investigate a person's qualities as they are reflected in any written text (e.g. a business plan or an application for a loan) or even a less official note. We have also tried to see the connections between entrepreneurship, leadership and strategy. So the next steps to be taken are to finally construct the three new measures that we proposed in this paper and to deal more thoroughly with the strategic aspects that might turn out to be disastrous if not taken in account.

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Venture Capital in Crisis

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As it is known, the recession and the collapse of credit markets affected the venture capital and business angel's market during the period of crisis. For those who think about new businesses or expand an old one, the forecast is mixed because it is not sure whether and how this will be quite profitable. The truth is that the crash of 2008 and 2009 did not result in an immediate and stranglehold way on many areas of financial markets. Surprisingly, the market for Venture Capital was one of those markets which was completely shocked. Things were bad, but the decline in venture capital has very low rates instead of much larger numbers in most markets. The problem is the attitude that we should have in the future. After that happened in previous years, we've read and heard that we are now in a recovery from the Great Depression. The fact is however that the recovery from the recession may not be easy. What can we expect? The 2012 and 2011, like 2010, is going to be a tough year for start-ups. About the companies which are looking to take the next step, the VC firms and angels will be more receptive to demands from companies that have a history. The venture capital market is not dead. Not even close. That said, there are many ''fishes" competing for ''food" in this market. Things finally may relax, but it can take quite a long time before this happens.

Keywords: financial crisis, the dotcom crash, venture capital firms

Jel: G24, G30

An Overview of the Venture Capital

Venture capital is a method of long-term equity financing business or investment assets which have a high degree of risk. Venture capital is an important source of finance for high growth, innovative companies, one of the few sources withan appetite for risk that matches the uncertainty that comes with pioneering, innovative ventures and the ability to provide management support to take a company from initial proof of concept to mass market growth.

The difference between venture capital and other funding sources identified in the search of business risk, something that normally does not exist in other forms of financing and in the active engagement of the manager in carrying out the dangerous project by providing additional services. In addition, in debt financing the banks ask for collateral in order to make the funding, while in the case of venture capital the investor has not only secured but also share the risk.

The Financial Crisis and the Dotcom Crash

The venture capital industry in the UK has been in a period of decline. UK startups saw a 40% decline in venture capital activity in the past two years according to new research by the National Endowment for Science, Technology and the Arts (NESTA). The number of exits has fallen by 40% and fundraising dropped by over 50% both in terms of the number of funds raising new capital and total amounts raised. This has been particularly true for early-stage venture capital. A report of NESTA examines similarities and differences between the current crisis and the one triggered by the dotcom crash and consider prospects for a recovery.

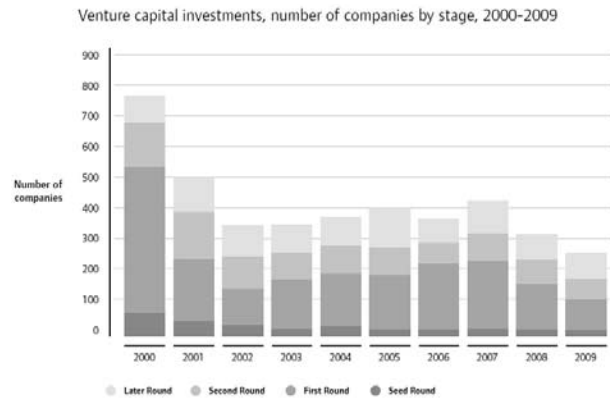

FIGURE 1

The report written by Yannis Pierrakis[1] outlines a number of important trends:

• Fundraising in 2009 was the lowest seen in the past decade. Both the dotcom and financial crises resulted in a significant reduction in the number of new venture funds established. However current fundraising activity is considerably lower than levels seen after the dotcom crash and consequently the lowest level seen in the last decade. Amid this market gloom however there are some promising signs. The fundamentals of the UK Venture Capital market appear sound, with evidence of funds exiting companies and making good returns. Further, with significant amounts of capital invested in new companies between 2004 and 2007, a large number are expected to bear fruit over the next few years.

• The time taken to successfully exit, through a flotation or acquisition, is getting longer. Across the world this averages almost seven and a half years, the longest period seen over the past two decades. This global trend is reflected in the UK market and has a knock on impact on a fund's ability to attract further investment.

• ICT continued to attract the largest proportion of investments followed by Consumer and Businesses and Healthcare and Medical industries.

How the recession affect the Venture Capitals

The recession can not be left unaffected in the funding of Venture Capitals. The shapes are involved pension funds, institutional investors, independent investors, government institutions, and as noted above significant amounts of Venture Capitals traded through stock exchanges. Entering the stage of a recession means reduced consumption, reduced corporate profitability, rising unemployment to reduce business costs, causing a vicious circle. This vicious cycle leads to high government deficits which support the economy, high interest rates, scarce funds in higher tax rates, austerity programs and to the consolidation of financial aggregates of declined economies with devastating consequences for development. These limited effects which are reported above, vary in the extent and degree according of the magnitude of the recession.

The recession we are experiencing has its roots to the excessive degree of leverage which supported the developing economies for years; with more loans from the banking sector, withstand much more than they intended to lend. The banks' violation of important rules of financing was the name of the continuous growth and high profitability. Although, the real growth, must be based on actual production and high yields are only justified for new innovative goods and services. The quick and easy access to borrowed money led to more goods at high prices, feeding back the need to borrow to unrealistic levels. The downturn is a phase in which an economy enters in order to find its equilibrium, price properly the economic developments and gather forces for the next rise. But when we intervene in this process, the one the governments to show effectiveness and the other the business world to produce continuous profits, in order to cancel this process, we can only succeed to prolong the negative effects of which have multiple impact on the future.

This phenomenon is currently on eye in the world economy and the lack of funds is very high. About the impacts of the recession on the theme of Venture Capitals we can see a sharp drop in the capital investments. As Alana Semuels assumes[2], in the U.S. in the first quarter of 2009 we saw a decline in investments by 52% to $ 1.68 billion in the information sector, which includes companies that are engaged in the sectors of hardware and software. This performance was lower compared with that of 1997, while the 231 takeover agreements were fewer than in 1995. The decline in investment in Northern California reached to 35% (reaching $ 467 million), while in Los Angeles the fall reached to 40% (to $ 150 million), compared with the previous years. Investments in energy and commodities fell by 59% at national level to $189 billion. The reasons for the above situation can be found to the fact that Venture Capitalists can not sell their holdings which are constantly losing their value on the stock market, reducing their assets and the ability to invest. Many people deal with the salvage of the companies' portfolios. This situation however will lead to the healthy restructuring of the industry, after the removal of many reckless investors who are leaving the territory to those who know well how to create healthy firms and be rewarded for it. In the figure below we can see the downward trend of investments, from the perspective of Venture Capitals. As we can observe, the amount of investment in the first quarter of 2009 is neither half of this first quarter of 2007.

Effects also exist in amounts which are collected from the industry of Venture Capital, and in accordance with Clair Cain Miller[3], in the third quarter of 2009 we can see a decline in the number of Venture Capitals which obtained funding from 63 to 17, in the same period of last year.

FIGURE 2

This was the lowest performance since 1994, while the amount collected reached, the $ 1.6 billion, lower than 2003. Despite the consequences, the contraction of the sector is on the centre of attention. As major market players stated, much money fund too few good ideas. The state of financing from companies of Venture Capital in the third quarter

2007 to third quarter of 2009 is shown in the figure above, where it is obvious the strong decline of the lower figure of $ 1.558 million to the third quarter of 2009.

The downturn has not affected only the amounts invested by Venture Capitals but also the areas to which was invested and at what stage. Sarah Lacy[4] highlights the fact that investment Venture Capital for new business fell substantially, because for the first time the Venture Capitalists feared so much. They feel more confident in making investments in technology and few companies in the portfolio has a value that can be liquefied.

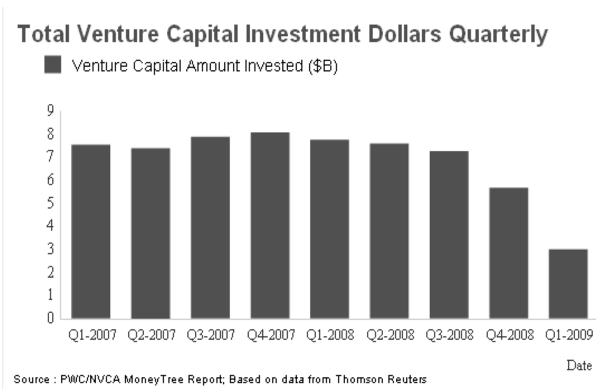

FIGURE 3

According to the return on investment of specific sectors, the sector and health care seems to resist to the crisis and not follow the decline which is generally in the industry. In this industry, we can observe mobility in acquisitions by pharmaceutical companies.

The clean technology sector is a sector which had invested much of its hope and is very promising. However, while invested considerable funds, the trend so far not identified the expected returns. The chart below shows the amounts invested in the internet and clean tech sector. It is clear that ultimately the significant investments that generated real profits have been lower than those to be carried out. In a general climate of euphoria and lavish funding, many would have convinced Venture Capitalists and non-institutional investors to put their money into dubious projects that the only advantage they had was probably the match with an industry with high potential. But the high potential by itself does not create wealth. They are merely a chance. Thus the period of high and unreasonable valuations for many companies has led to an increase in assets of many Venture Capitals and new investments by increasing leverage and risk It all started from the financial sector due to the collapse of mortgage loans. Thus, began a process of de-leveraging and the broadcast industry Venture Capitals which is an integral part of it. The results of this situation reflected in these statistics; reducing funds available for financing, bankrupt companies for funding, reducing investment and profitability of companies.

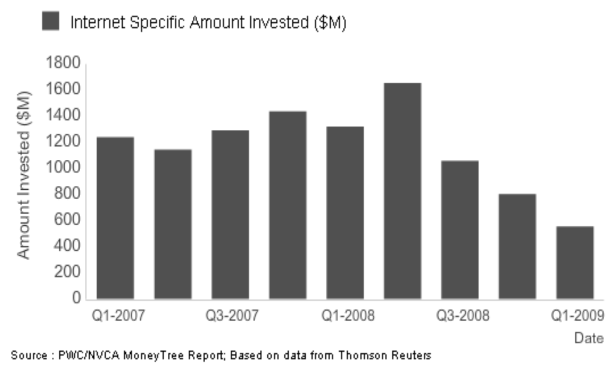

FIGURE 4

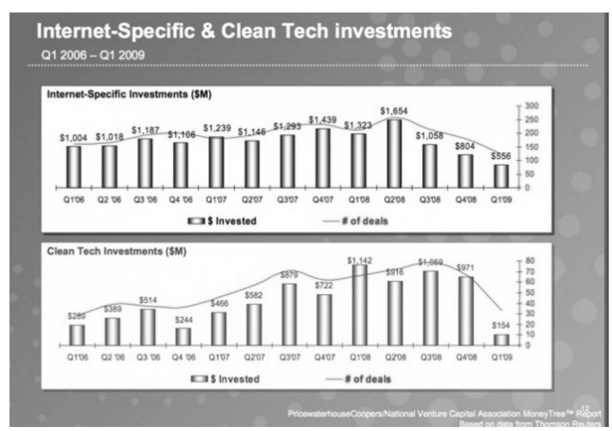

FIGURE 5

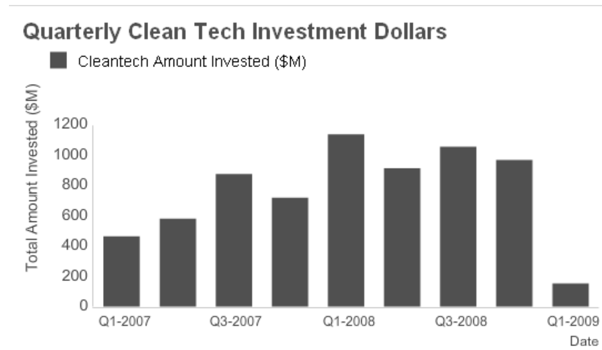

FIGURE 6

Opportunities of Development through Crisis - The Role of Venture Capital

The financial crisis is an embarrassing and painful process through which restored balance, recovering valuations, and the rational way of decision making. Through such a process created opportunities especially for those who are active in innovation-driven, efficient use of capital, foresight. In the midst of this crisis there are investors and traders who follow the rules of economics and have remained strong. They had the foresight to preserve funds for the difficult times and made no excessive use of loans. They are currently in a position of power and freed from many competitors who entered the competition without the necessary qualifications. They have the opportunity to make profitable acquisitions at prices much lower than its accounting valuations, taking advantage of their exposure to excessive borrowing.

The recession except for the acquisition of opportunities at very low prices, it is also an incentive for innovations as many people losing their jobs and they are looking for possibilities how to survive. This way, they make real good ideas that previously would not dare to apply if they have a good salary. Lee Egerstrom[5], tried to reflected the view of Deb Hess Executive Director of Redwood Falls, a non-profit organization based in Minnesota, USA which argues that people become creative in how to discover new products during a recession. The above view is the finding of an informal telephone survey to which participated 8000 people.

The big problem in these cases is that they can not obtain financing. Cases where Venture Capital investing in such companies are too few as there is not enough liquidity, there is willingness to risk inherent in the early stages of an investment. The companies can finance the independent investors such as business angels, and have an important role of the state at this stage by giving some subsidies, fiscal and other incentives. If these companies can survive and mature, they will become the aim of Venture Capitals.

Trends and strategies of Venture Capital and reflected in a survey carried out by the rating agency Deloite[6]. The survey covered a sample of 725 Venture Capitalists from America, Europe, Asia and Israel, with assets ranging from less than $ 100 million to more than $ 1 billion., Divided into categories, 35% of the companies involved managing assets between $ 100 - $ 400 million, 34% were managing assets of $ 1 - $ 99 million, 17% related assets over $ 1 billion and the remaining 14% of assets worth $ 500 million-Si billion. 72% of respondents engaged exclusively on Venture Capital, while 28% carry stock and other investments.

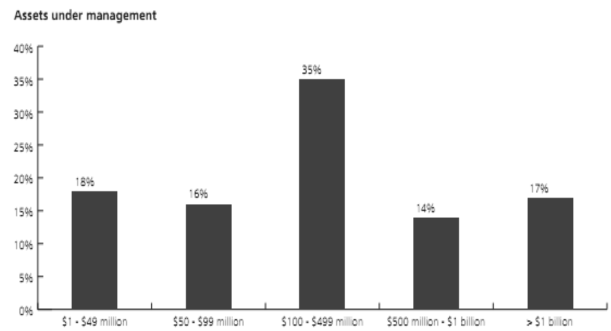

FIGURE 7

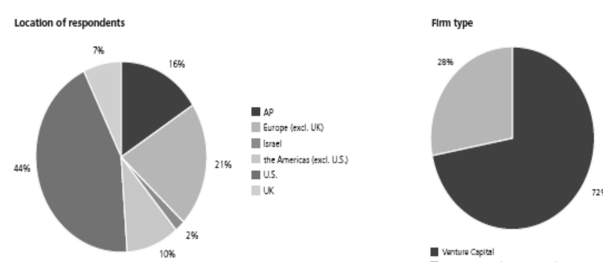

FIGURE 8

The poll showed that while everyone understands the depth of the recession there is optimism for the future. More specifically, there are sectors of the economy such as telecommunications and semiconductors which are developed quite well, while the health sector and that clean technologies are good prospects. As below figure shows the trend of the areas concentrated investment interest in Venture Capitals. There is a clear tendency to focus on more profitable and quality of its portfolio companies and to increase investments in companies that are in the process of maturation. Few and profitable investment is the prevailing philosophy. Adapting to new conditions has been launched and as supported by the President of the NVCA tourists left. Wanting to emphasize the fact that the industry was exempted from those who thought that they could have only a good idea to get rich quickly and easily. Entrepreneurs understand that the valuations of their companies is significantly lower than in the recent past. On the other hand, it is shorter the financing that they will be able to claim.

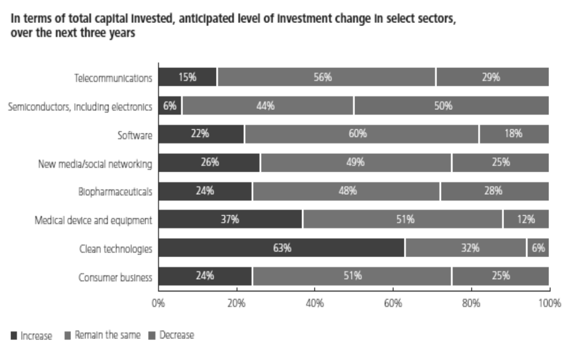

FIGURE 9

The lower valuations of candidate investments because of the crisis is an opportunity for investment Venture Capitalists. Although this reduces, the investment and the decline is relatively greater for Venture Capitals with assets over $ 500 million compared to the smaller. Chart shows the trends in the level of investment for each category of Venture Capital asset base.

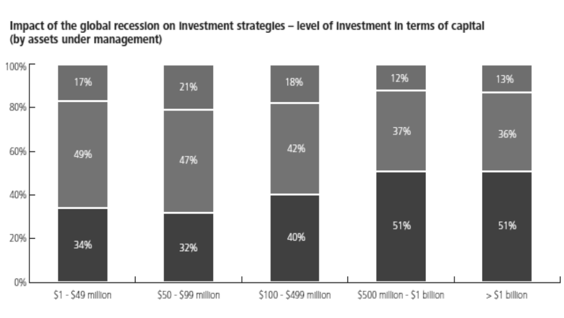

FIGURE 10

From the survey as noted in previous paragraphs, Venture Capital firms seeking attitudes in adult life, having a satisfactory level of sales and lower risk. Furthermore, the investment in mature stage enables faster liquidation of the investment. The chart below shows the above trend.

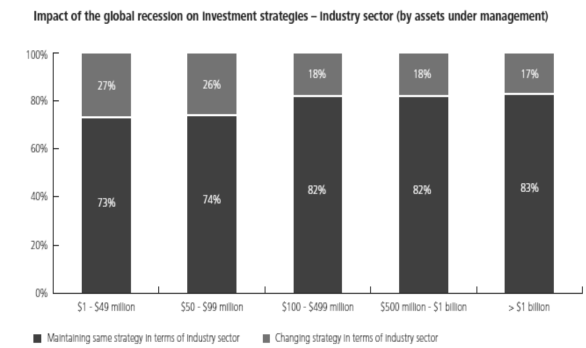

FIGURE 11

Important is the emphasis given by the Venture Capitalists to incentives which encourage innovation. The most important incentives for the respondents are low taxes, and the research grant is the second emphasis of motivation. Other incentives such as facilitating technology transfer, improvement of infrastructure such as airports, ports and the existence of efficient financial markets are important prerequisites of Venture Capitalists. The chart below summarizes these incentives based on the weight given by respondents to each stimulus for the next ten months.

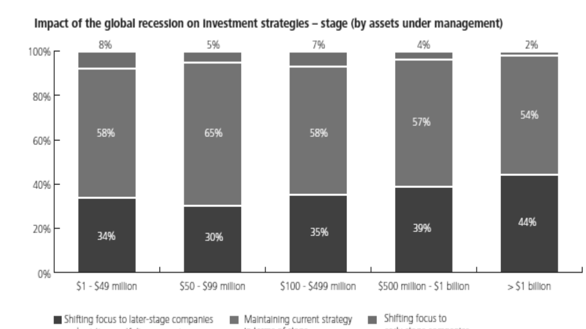

FIGURE 12

In a global market, Venture Capitalists looking for profitable investments wherever they are. Half of the respondents want to invest in markets with potential as Asia and India. Extroversion seen in the search for foreign partners to strengthen the assets of Venture Capitals. The vast majority of Venture Capitals expects to attract and retain foreign limited partner. Although the economic climate is not conducive to attracting investors to increase their assets Venture Capitals, the Venture Capitalists are optimistic that the confidence of potential investors will return as special mention those companies that do a good and beneficial management of funds. As shown in Figure how optimistic about the future size of their active managers out Venture Capital small (up to $ 499 million assets). At the same time would like to participate in investment patterns and government in this effort that can contribute decisively to the revival of investor interest.

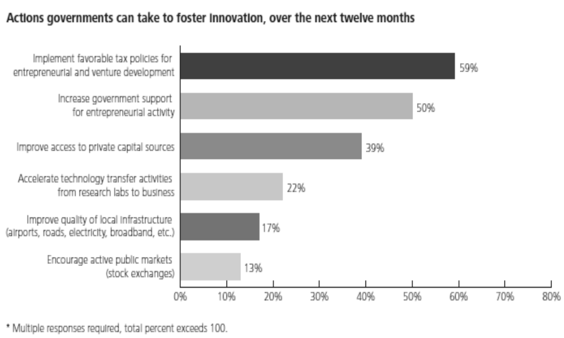

FIGURE 13

Last but not least, Venture capital investment in China life science in 2010 reached new highs[7] reaching almost $700 million. Also, it is stresses that more than half of that have gone towards drug development. To put that in context, the prior high was $400 million in reported fundings in 2007. In between 2007 and 2010, the financial crisis reduced that number. Another sign of vibrancy in China's life science industry is its robust dealmaking. 2010 was the best year for IPOs from the sector. Companies had raised $5.3 billion in 26 offerings, $3.9 billion of which went into drug companies. The average offering size was $202 million. For the most part, these were established companies that had strong base in generic products. However, many of these firms were also developing novel drug candidates. This way, it is expected, these positive exits for investors to stimulate further venture capitalist investments.

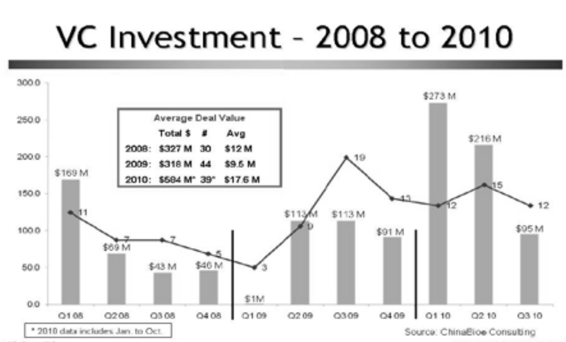

FIGURE 14

The State Role

In the previous sections we highlighted the Venture Capitals' aversion to finance new businesses before mature and prove their potential. There is therefore a gap in the market to finance valuable new ideas, depriving the economy of enterprises that will create growth and jobs.

Since the time the private enterprise is unwilling to fund new innovations, the state is the only body that can fill this gap[8]. The creation of State Venture Capitals to be involved in financing innovations at an early stage is a solution. The successful development of new businesses will also increase the range of private Venture Capitals enterprises, who will take the baton from the state taking over business development. The state will "light the spark", while individuals will "fire flared up".

Government Venture Capitals

The state's involvement in this process requires the creation of Venture Capitals which will employ accountants, lawyers, managers with experience in the market and generally people with scientific training on the products and services under consideration. The big advantage is the collaboration with universities which have the scientific training and tools to assess situations and make the necessary investigations. To be successful involvement of the state should respect certain conditions.

The first condition is to check the momentum of a new innovation in order to determine whether it is impractical; if it prospects for the sector to which it belongs and what is the business plan.

The second condition is the size of the financing. The purpose of government is to make the first allocating funding to enable the company to proceed with the activities and not just one device. On the other hand the funding should not be too high and should not be to adult life, because this would compete with private Venture Capitals, creating disincentives for their operation. The two funding agencies, government and private should be complementary and not competitive.

Important is not only to make innovation and rapid diffusion in order to become more competitive by increasing sales and reducing the cost of the product by mass production. In this case the state can assume the cost of initial production quantities in order to import goods in the market quickly and increase the marketability.

Policies of Effective Functioning of State Venture Capitals

The success of State Venture Capitals can be achieved under certain policies that enhance their role. Such policies are:

Merit-based evaluation of candidate investments. Investments that will be selected for funding should be as objective and not deserve them favored by political interests. Investing in an unrealistic business plan will result in loss of capital. The favor of certain companies without merit among other data distorts competition causing adverse effects on competitors, who may be better able, but will lose valuable ground creating the various problems the meritocratic finance business will serve as a disincentive for an investment by disadvantaged entrepreneurs. Sovereign Venture Capitals should complement private. The State should monitor developments in the private sector to establish the gaps and where in necessary to intervene. It should in no way compete the private sector, but strengthens it by covering his weaknesses. In times of recession the state should have a more active role in funding, the private sector run out of funds. At such times it is also permissible to fund the companies owned by private Venture Capitals to achieve their goals.

- Seeking Venture Capitals of state funding is not popular technologies, fostering new entrepreneurs who do not belong in the field of interest of private Venture Capitals. This is very important in times of recession, as we live now, when during a recession many people are willing to start businesses and do not find funding.
- Flexibility in the operation of State Venture Capitals. The involvement of state and automatically adds the factor bureaucracy in the process. The safeguarding of public funds should not be a disincentive to entrepreneurship, putting many restrictions and conditions in order to finance an entrepreneur who has the skills to succeed.
- Attracting capable partner for the management of State Venture Capitals, giving them appropriate incentives in order to be efficient. These incentives can be rates in Venture Capital and productivity benefits match the private sector.

The role of the state is not limited to the establishment and operation of State Venture Capitals, but can contribute in other ways. Tax incentives for young entrepreneurs, lower employer contributions, simplifying procedures for establishing enterprises are some measures that can be used to stimulate entrepreneurship. It is important that these measures are easily accessible to traders without much red tape, restrictions and exceptions.

The global economy requires a common language as a reference illustrating the economic events and evaluating the progress of business. The introduction of International Accounting Standards (IAS) helps in this direction by giving the opportunity for foreign investors to have a complete picture of a business. The introduction of IFRS in more countries and enterprises and the faithful implementation would encourage more international investment. In order to attract foreign capital a very important factor is the law on foreign investments and how to adapt them in such a way that is beneficial to the foreign investor and the State in which the investment. Developed and reliable financial markets are challenges for any investor. The state should ensure the existence of such a market to a quick realization of an investment and as a fund-raiser for business. Reliable and well-functioning stock market under the rules which govern it can be translated into confidence by investors and more capital.

Conclusions & Suggestions

From what has been said so far it became clear that the development of new innovative ideas requires not only funds but a mix of finance, business proposal evaluation, monitoring, mentoring within the context of legal, monetary and fiscal policy, the overall political and macroeconomic environment, not only nationally and globally.

The Venture Capitals is a link in the chain of development where it interacts with all these factors. The development of enterprises depends on the effectiveness of the Venture Capitalists who are asked to evaluate and develop business plans that require specialized knowledge and ability to lead. Successful companies generate growth and new jobs. The reluctance of Venture Capitals to fund operations at an early stage because of high risk may be replaced by the creation of State Venture Capitals as done in the U.S.A. In this case the state operate before the involvement of private Venture Capitals, to take the risk of developments and when the company reached to a mature stage the State can deliver it to the private sector which should be a complement and not a competitor.

A financial crisis has a negative impact on the assets of Venture Capitals, which decreased due to lower valuations of the companies involved, while institutional investors and pension funds operating losses, reducing their capital. Although the exit from the crisis can only be achieved by funding innovative business plans that will create real output, the role of government is also crucial.

The Government should start the engine of production financing investments in early and advanced stages if the private sector is unable to do something like that. In short, the state is what we need to keep a balance in order to supplement gaps in the private sector and secede when the private sector takes action. The state plays the role of the guarantor system and it should raise funds in grown periods, leaving the bulk of these individuals. When the recession occurs the State will take action in order to give the necessary impetus.

However, the provision should not be limited only to money that should be available during the recession. The provision relates to efficient functioning of markets in periods of boom economies. Effectiveness means fair market valuation of companies' securities to avoid phenomena of fictitious profits which may be liquidated by some cunning trap investors leading to losses in their funds. This logic should prevail not only in the financial sector, but in every aspect of economic life. It is a matter which culture should be cultivated in all of us. There are no quick and easy profits. A practical rule says that when stock market rises quickly it also falls quickly. What is needed is the development and exacerbations without exaggeration. A few cases justified high levels of profitability and that requires much work.

In this sense, a recession operates as a relief valve, serves the financial system to correct the excesses and be cause for corrective action by the state, business and consumers. But when someone interferes in the operation of this valve and keeps it closed, it will only be able to cause a multiple deep recession, as we are experiencing today, because will not have the power to withhold it anymore.

So, apart from its role as guardian of the state guarantor and promoter of development in the ways mentioned above, it is important to have a culture of development based on productivity rather than overconsumption and overloading, seeking for fair rewards. This logic may lead to more productive ideas from the perspective of entrepreneurs. This way, it can ensure a more reliable financial system, which is part of the Venture Capitals, that in a climate of stability it can provide the conditions for rational development.

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Examination of Linkages between Stock Markets - A Quantitative Approach of Fundamental Statistical Variables

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Abstract: In today's globalized financial markets, it is vital that we should have a strong evidence of the relationship between them in view of systematic risk. In this paper we attempt to examine the linkages in different stock markets through a quantitative approach, with the intention of unraveling whether these markets are repetitive. More specific, we are trying to distinguish the relationship between Greece's stock market and the most important stock markets in Europe, as well as relationships among European stock markets. The period in which we focus our examination is for five years and in detail, from 2006 to 2010. The analysis is based on the examination of fundamental statistical variables, such as mean, median, variance, covariance, skewness, kurtosis and the implementation of the vector auto regression model (VAR) to all the examined stock markets. Furthermore, a significant aim of this paper is to investigate the elements of different stock markets which seem to have strong similarities with the corresponding components of the Greek stock market, according to the examined variables and describe the conditions under which these stock markets are in danger of seriously, negatively being influenced by the volatility of the main macroeconomic variables.

Keywords: stock markets, correlation analysis, cointegration analysis.

Jel: G15, C58

1. INTRODUCTION

The examination of the linkages and relations between different stocks markets in today's academic fields is of high importance. This happens as the necessity for minimizing the non systematic risk and simultaneously the creation of an efficient portfolio is becoming bigger and bigger in an environment of high macroeconomic uncertainty and consecutive economic cresses. Scanning the literature review about correlations and long term relation between different stock markets, we find that the results are highly controversial. On the one hand, there are papers that find no significant correlations among stock markets. However, there is as equally number of papers that suggest strong correlation and long term relation in the examined markets. Of course, it is a very difficult task to decide whether two or more markets are strongly connected, in terms of correlation coefficients and cointegration tests, as the prerequisites, (such as mean, standard deviation, different parameters) under which these techniques for testing the relations, based on are changing rapidly, in an environment of uncertainty, lack of trust, and political and economic instability. Consequently, papers that are written decades before may not reflect the nowadays trends and for that reason the results create a confusion regarding the main purpose of these papers, which is to examine the correlations between different stock markets. At this point we have to mention that the connection between two or more stock markets is not a permanent situation, but is changing continuously through years. This means that two markets that were correlated in the 90's, now they may not be connected or they may have a negative correlation, depending on the macroeconomic and microeconomic factors of the two markets. The most striking aspect of the above could be the case of Greece. The years before the entrance in the Eurozone, the Greek stock market may have had a strong connection with developing countries such as Balkan countries or some Asian Basin countries. Since Greece became member of the Eurozone the situation in Greece has gradually changed in terms of economic and social growth. The developing rates of the Greek economy contributed to be characterized as developed country, and this may have affected the relations between Greece's market and the other developed markets. In other words, the examination of correlations between different stock markets is a very sensitive and difficult task, because a stock market reflects the political, economic and social expectations. In this paper, we study the linkages among eleven stock markets from Europe; Greece is included, using their basic indices. First, we are trying to calculate the correlation coefficients among these markets. Then we examine if there are long run relationships between Greece's stock market and the rest markets of our sample using the cointegration analysis. From the results of the cointegration analysis we have evidence about the indices that are very important for international stock market influences. The organization of the paper is as follows: section 2 reviews the literature, section 3 describes the methodology used in the paper and section 4 presents the empirical results. Finally, in section 5 the conclusions are presented.

2. LITERATURE REVIEW

There is a lot of academic work in the field of correlation, cointegration and fundamental similarities between different stock markets. There are researches showing that there is significant correlation between particular markets and other indicating that there is no important connection between examined stock markets. Many researches such as Hilliard (1979), Jaffe and Westerfield (19851,1985b), Eun and Shim (1989), Von Fusterberg and Jeon (1989) and Cambell and Hamao (1992), show that there is positive correlation between stock markets. According to Roll (1992), the mean correlation between the different stock markets is low at price and is related with great variance among the examined stock markets. In the examination of the correlation of stock markets, the use of gravity models is becoming more and more widely used. There are models that seek to explain the connection between stock markets and investigate patterns in the co – movements of particula11r stock markets. Nevertheless, Anderson (1979), Bergstrand (1985), Feenstra, et al. (1998), Anderson and Van Wincoop (2001) have expanded theoretical background. The importance of the correlation between stock markets can be recognized by the crucial effect of contagion in the international financial sector and is becoming more and more vital due to the increase of the capital flows across national boundaries and the existence of lead-lag interrelationships among stock exchanges. King and Wadhwani (1990) developed the idea of market contagion whereby shocks in a major market, such as the US, spills over into other markets. With the United States being a major investor in many countries and posing a huge political influence on several countries in the world, studies have been done to investigate the causal relationship between the United States and other equity markets. Results indicate that the United States is an important global factor that moves the world markets. For example, Eun and Shim (1989) examine nine major stock markets (Australia, Canada, France, Germany, Hong Kong, Japan, Switzerland, the United Kingdom and the United States) over the period of December 1979 through December 1985, and find evidence that the United States market is leading worldwide trends. Cheung and Mak (1992) examine the causal relationship between the developed markets and Asian emerging markets and find that the United States market is a 'global factor' which leads both the developed and most of the Asian emerging markets. Forbes and Rigobon (2002), implemented parameter stability tests based on conditional correlation analysis which correct for three types of bias, resulting from heteroscedasticity, endogeneity and omitted variable respectively, in order to find the influence of strong linkages to the mechanism of contagion. The vital role of correlation can be easily understood by the long and extensive academic research in the field of interdependence and is becoming more and more important due to the increase of the capital flows across national boundaries and the existence of lead-lag interrelationships among stock exchanges (. Corhay et al., 1993). As far as cointegration analysis is concerned, this is the most popular approach that examines linkages and causality between stock markets and there is a lot of research that shows either the lack of cointegration between examined stock markets or the cointegration evidences between markets that can be characterized as emerging or emergent, according to the fundamental market components in each case. Cointegration analysis was firstly developed 19 years ago, starting with the seminal contributions by Granger (1981), Engle & Granger (1987), and Granger & Hallman (1991), Kanas (1998) examined the existence of cointegration between U.S.A stock market and the corresponding stock markets of six European countries. The evidences showed the lack of cointegration between the examined markets. Kniff and Pynnonen (1999) examined the cointegration and the linkages between powerful markets, such as U.S.A and Japan stock markets and the influence of these markets to smaller stock markets. The results showed that changes in the stock prices in U.S.A had important influences to the other stock markets. According to Bruner et al., (2008) there are indicators of cointegration between countries that can be characterized either as emergent or as emerging, result that confirms the positive correlation between stock markets and the possible further market cointegration.

3. METHODOLOGY

In order to find the linkages between different stock markets, we used a methodology in three stages. Firstly, we calculate the descriptive statistics for each index, and more specifically we calculate the mean, median, minimum and maximum returns, the standard deviation, the kurtosis and skewness. In this section also we calculate the Jarque-Bera in order to test the normality of each index.

Secondly, we use a correlation analysis, by calculating the correlation coefficients, so as to distinguish the relations between the different indices. The correlation coefficient between two variables x and y is defined as:

$$\boxed{\rho x, y = \frac{\operatorname{cov}(x, y)}{\sigma x \sigma y}}$$

The correlation coefficient can take values in the interval [-1,1] or $-1 \leq \rho X,Y \leq 1$. If $\rho=1$ that indicates that there is a perfect positive dependence between the two variables that it means when the variable X is increasing the variable Y, also is increasing by the same amount. If $\rho= -1$ that indicates that there is perfect negative dependence, in other words, when X is increasing, Y is decreasing by the same amount. Generally speaking, when the coefficient is near 1 it is a strong indicator of a strong relation. If $\rho=0$ this means that there is no linear dependence, but we cannot make clear whether they are independent .

The last part of our methodology includes the cointegration analysis, which shows whether there is long term equilibrium between two variables. We use the Johansen cointegration test in our paper. However, before applying this test, we have to test the stationarity of each index, as the Johansen test prerequisites non stationary time series, that it means the series has a unit root. In order to test the stationarity of each index, we use the Augmented Dickey-Fuller test (ADF). Using this test we are trying to find the integration order of each series. The Johansen method (1988) applies the maximum likelihood procedure to determine the presence of cointegrating vectors in non - stationary time series and detects the number of cointegrating vectors. Johansen adopts a framework that is based on the assumption that introducing sufficient lags will allow for a well-behaved disturbance term. The Johansen procedure analyses bivariate and multivariate cointegration, directly investigating cointegration in the VAR (Vector Autoregression) model. Let Yt a vector nx1 of nonstationary series which is integrated of order 1,Yt~I(1). Denote the VAR model of order p as:

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \ldots + \Gamma_{k-1} \Delta y_{t-(k-1)} + u_t$$

The test for cointegration between the y is calculated by looking at the rank of the Π matrix via its eigenvalues. If the variables are not cointegrated, the rank of Π will not be significantly different from zero.

4. DATA AND EMPIRICAL RESULTS

The data set used in this paper consists of nine indices from European countries, one from USA and Asia respectively. Particularly, we used the index CAC40 for France, DAX for Germany, IBEX35 for Spain, MIB for Italy, IGEN for Ireland, PSI20 for Portugal, SMI for Switcherland, FTSE100 for England, Athens General Index (AGI) for Greece, DowJones for USA and Nikkei for Japan. The time period we used in our analysis is for five years, January 2006 to December 2010, for daily observations.

Table 1 shows the descriptive statistics for the eleven indices. More specifically, is presented the average return and the standard deviation for each index and some others fundamental statistical variables.

Table 1: Descriptive Statistics

	CAC40	DAX	DJI	FTSE100	AGI	IBEX	IGEN	MIB	PSI20	SMI	NIKKEI
Mean	-0,002%	0,034%	0,018%	0,014%	-0,059%	0,015%	-0,009%	-0,053%	0,003%	-0,005%	-0,021%
Median	0,035%	0,102%	0,041%	0,000%	0,093%	0,091%	0,034%	-0,099%	0,020%	0,037%	0,018%
Maximum	10,624%	10,795%	10,515%	9,384%	9,136%	10,117%	6,930%	8,362%	9,703%	10,786%	13,244%
Minimum	-9,477%	-7,434%	-8,200%	-9,272%	-10,223%	-9,584%	-10,042%	-9,492%	-10,384%	-8,115%	-12,111%
Std. Dev.	1,648%	1,554%	1,426%	1,466%	1,881%	1,694%	1,554%	1,863%	1,450%	1,332%	1,791%
Skewness	0,152	0,240	0,088	-0,051	-0,399	-0,042	-0,542	-0,139	-0,243	0,161	-0,372
Kurtosis	10,04	10,75	11,07	9,63	7,61	9,61	6,37	6,78	14,31	9,74	10,15
Jarque-Bera	1769,35	2145,76	2323,20	1564,28	7808,72	1559,10	4473,95	5126,78	4566,90	1623,65	1841,77
Observations	855	855	855	855	855	855	855	855	855	855	855

The first comment we have to do is that none of the indices is distributed normally, as the Jarque-Bera indicates that. Over the examined period the best return is that of the DAX index with 0,034%. The most risky market in terms of std.deviation is the Athens General Index with 1,881%, whereas the safest market seems to be Dow Jones with 1,426%. As we can notice, markets of Greece, Italy, Ireland and Portugal have negative returns. This may be attributed, up to a point, to the macroeconomic instability over the last year. Especially, the Greek stock market has run a downfall after the advent of IMF and the ominous conditions about the Greek economy.

Table 2 presents the correlation coefficients between stock market returns. The coefficients are positive and generally different from zero in all cases which illustrates the high degree of comovement and integration among the economies in the sample. In terms of correlation coefficient, Greece seems to be connected in a positive aspect with the most European markets and also with the Dow Jones and Nikkei. Also, there is a strong connection among European markets, and this may be reinforced by the influence of the European Union.

The hypothesis of a single unit root in each index is accepted but strongly rejected in the first differences of the prices of the index. Thus, like most financial time series, all the data series are integrated of order one, I (1). The models used for the ADF statistics are all with constant and time trend.

The following table 4 represents the results from the cointegration test between the Greek index and the rest indices of our sample. In order to test the cointegration we established two hypothesizes; Ho= the two examined indices are not cointegrated (r=0) and H1= the two indices are cointegrated at order most one (r≤1). The test based on either the Trace statistic or maximal Eigenvalue, whereas the lags of the VAR model have been chosen by using the Schwartz Criterion in order to ensure that the residuals in each equitation are uncorrelated.

Table 2: Correlation analysis

	CAC40	DAX	DJI	FTSE100	AGI	IBEX	IGEN	MIB	PSI20	SMI	NIKKEI
CAC40	1,00	0,07	0,08	-0,03	0,07	-0,04	0,01	0,02	0,04	0,01	0,07
DAX		1,00	0,01	0,03	0,08	-0,09	0,02	0,05	-0,07	0,03	-0,05
DJI			1,00	0,02	0,03	0,01	0,03	0,22	-0,04	0,04	0,01
FTSE100				1,00	-0,03	-0,04	0,08	0,01	0,01	-0,01	-0,07
AGI					1,00	0,04	-0,07	0,06	0,01	-0,02	0,06
IBEX						1,00	-0,01	-0,02	0,01	0,07	0,07
IGEN							1,00	-0,03	0,02	-0,03	0,08
MIB								1,00	0,05	0,03	-0,03
PSI20									1,00	0,03	-0,03
SMI										1,00	-0,04
NIKKEI											1,00

The next step in our analysis is to test the long term relation among the sample through the Johansen cointegration test. However, before doing this, it is vital that we check the stationarity of all time series of the sample. We use the Augmented Dickey Fuller (ADF) test for stationarity. Table 3 represents the results from the ADF test in levels and first differences.

Table 3: ADF test

	Augmented Dickey-Fuller test statistic	
Stock Market	**Levels**	**1st Difference**
CAC	-1,825	-38,578
DAX	-1,620	-37,063
DOWJONES	-1,294	-29,951
FTSE100	-1,576	-17,714
AGI	-1,995	-32,488
IBEX	-2,263	-36,286
IGEN	-1,518	-35,353
MIB	-1,619	-23,728
PSI20	-1,879	-32,131
SMI	-1,507	-17,766
NIKKEI	-1,988	-37,051
Significant at the 0.01 level. The critical values for the test statistics are −3.414 (0.05 level) and −3.968 (0.01 level)		

The above table shows that the Greek index has long term equilibrium only with the Nikkei index, according to the statistics. Noticing the results, we can claim that the Greek market seems to be independent in the long run, as the cointegration test does not indicate co movement with the most indices.

On the other hand, table 5 shows the cointegration analysis among the rest indices of our sample, where the long term relations are more. As we can notice from the following table the major indices in Europe are cointegrated with each other, and also the most European markets are cointegrated with the DJ and Nikkei. Also, DJ is cointegrated with Nikkei. Besides this, we can notice that smaller markets such as the Portu-

Table 4: Cointegration test

Johansen Cointegration test					
System	**Null Hypothesis**	**Tests for cointegration based on**		**VAR(*p*)**	**Cointegration**
		Trace Statistic	**Maximal Eigenvalue**		
GD-CAC40	r=0	9,134391	8,905991		
	r≤1	0,228400	0,228400	VAR(1)	NO
GD-DAX	r=0	2,316967	2,118271		
	r≤1	0,198696	0,198696	VAR(1)	NO
GD-DOW	r=0	6,272134	6,261941		
	r≤1	0,010193	0,010193	VAR(2)	NO
GD-FTSE100	r=0	4,691769	4,691766		
	r≤1	0,000003	0,000003	VAR(1)	NO
GD-IBEX	r=0	10,442870	10,442640		
	r≤1	0,000233	0,000233	VAR(1)	NO
GD-IGEN	r=0	7,324087	7,178495		
	r≤1	0,145592	0,145592	VAR(1)	NO
GD-MIB	r=0	7,198758	7,002697		
	r≤1	0,196062	0,196062	VAR(1)	NO
GD-NIKKEI	r=0	19,513720	18,606530		
	r≤1	0,907186	0,907186	VAR(1)	YES
GD-PSI20	r=0	13,869870	13,869870		
	r≤1	0,000000	0,000000	VAR(1)	NO
GD-SMI	r=0	8,056937	7,870689		
	r≤1	0,186247	0,186247	VAR(1)	NO
The critical values of the test based on Maximal eigenvalue are *14,26460* for r = 0 and *3,841466* for r≤1 and while the critical values of the test based on Trace are *15,49471* and *3,841466* respectively.					

guese market, represented by PSI20, seem to follow the bigger markets such as the DJ and Nikkei. However, this situation does not seem to be confirmed in the case of Greece, which is cointegrated only with Nikkei. In addition, we can claim that smaller markets are not in long term equilibrium with other smaller markets, as Greece, Portugal, Italy and Ireland.

Table 5: Cointegration test 2

Johansen Cointegration test										
	CAC	DAX	DJ	FTSE100	IBEX	IGEN	MIB	PSI20	SMI	NIKKEI
CAC										
DAX	NO									
DJ	YES	YES								
FTSE100	YES	YES	YES							
IBEX	NO	NO	NO	NO						
IGEN	YES	NO	NO	NO	NO					
MIB	NO	NO	NO	NO	NO	NO				
PSI20	YES	YES	YES	YES	YES	YES	YES			
SMI	YES	NO	YES	YES	YES	YES	NO	YES		
NIKKEI	YES	NO	YES	YES	YES	YES	YES	YES	YES	

4. CONCLUSIONS

In this study we tried to find out the relations and the linkages and the long term relations that may exist among different stock markets. We specified our analysis in the linkages that there are between Greece's stock markets and European, Asia and USAs' stock markets and then we checked all the other indices between each other. More specific, we examined eleven indices from eleven different countries. In the early stages, we present the descriptive statistics for each index and then we proceeded to a correlation analysis. This analysis operated by calculating the correlation coefficients for all variables of our sample. Then, in order to distinguish long term relation we applied a cointegration analysis using the Johansen cointegration test. The results from the correlation analysis shows that almost all the correlation coefficients are strongly positive, fact that indicates a co movement among the examined markets. We can notice strong relation between the major indices, but also the smaller indices seem to be quite influenced by the bigger. As far as cointegration analysis is concerned, the results show that Greek market is quite independent and isolated from the other markets of our sample. In particular, AGI is cointegrated only with Nikkei and with none of the European markets. However, the analysis for the other markets, show that there are many long term relations. Indices that collect a wide number of investors, such as DJ, Nikkei, and FTSE100 are in long term equilibrium. Furthermore, smaller indices seem to follow the predominant indices of the world, whereas among small markets there is no connection.

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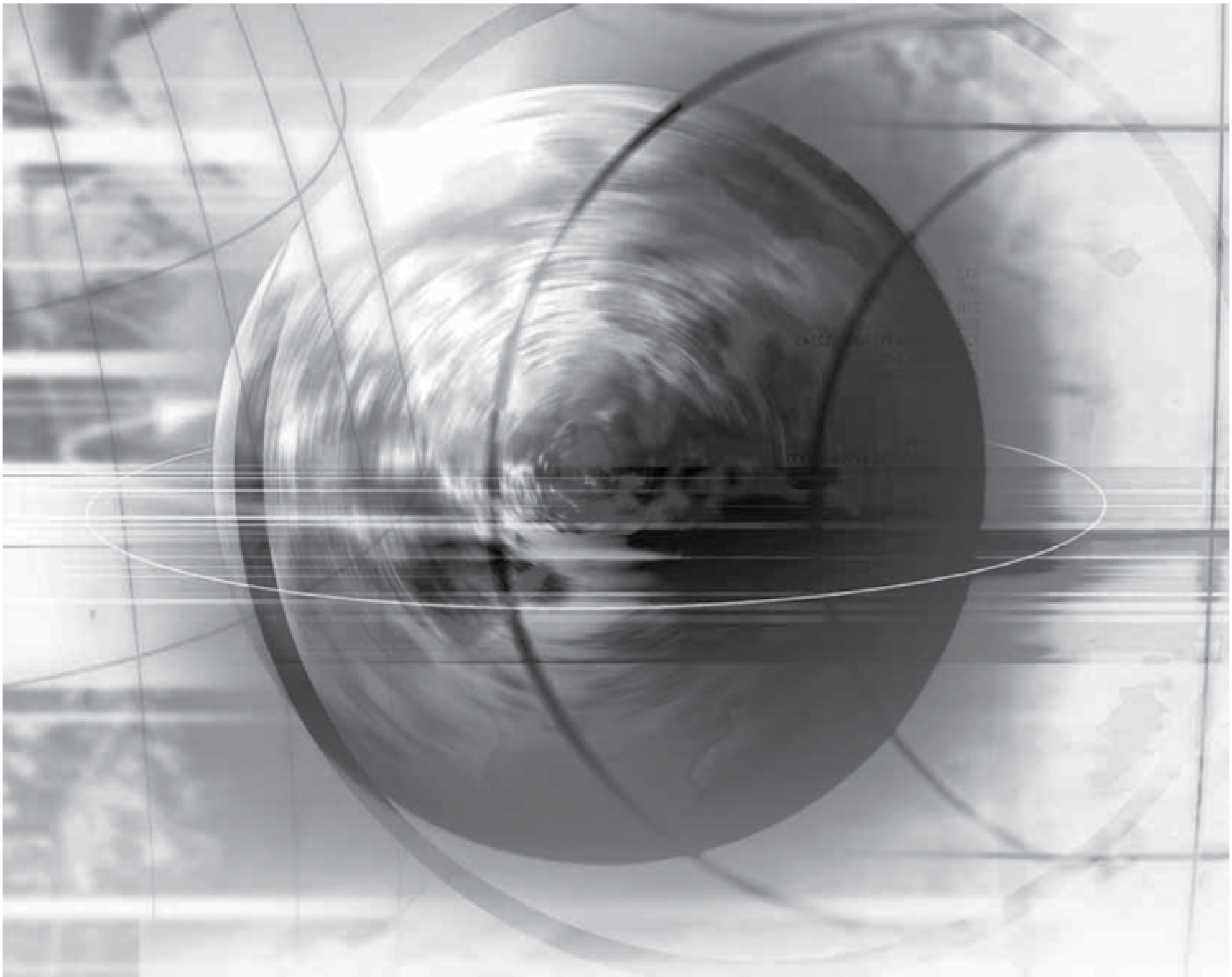

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