CRISIS' IMPLICATIONS ON SUSTAINABLE DEVELOPMENT THROUGH FINANCIAL CO-MOVEMENT AND CORRELATION

Camelia, OPREAN[1] and Ilie, BANU[2]
Lucian Blaga University of Sibiu, camelia.oprean@ulbsibiu.ro
Lucian Blaga University of Sibiu, iliebanu@yahoo.com

ABSTRACT: Every nation's economic development is directly impacted by volatility in its stock market. In this article we will try to explain the collapse of the Romanian stock market since 2008, and the changes to the current one in the context of the globalized financial markets. Stock market volatility has implications on financial and economic activities in Romania and the dynamics of major stock markets around the world can have ramifications on the Romanian stock market. The linkages among stock markets can be analyzed to determine if there are any common forces driving the long-run movement of stock indexes or returns, or if each individual stock index or return is driven solely by its own fundamentals. In this paper we investigate the co-movement of the Romanian market with major stock markets, with special reference to North America and Europe. The study is hoped to show the linkages of how Romanian stock market react on the international financial arena with differing inflows of information and economic shocks from the international stock markets. The Romanian investors had "imported" the crisis through financial investments, at the time when the economic crisis was not yet felt in the national economy. The Romanian stock market volatility due to world market dynamics has further implications on financial and economic activities in Romania.

1. SUSTAINABLE DEVELOPMENT - THEORETICAL ASPECTS

The concept of sustainable development is the result of an integrated approach to policy and decision makers, where the environment and long-term economic growth are considered complementary and mutually dependent.

The essential characteristics of sustainable development can be summarized as: equity, long-term approach, and systemic thinking.

Equity implies a fair distribution of costs and benefits of development between the rich and the poor and between generations and nations. The long-term approach takes into account the needs of future generations and the development of equitable development scenarios that are based on limited natural resources of the planet.

In economic terms, the key points of sustainable development are the reduction of environmental pollution and natural resource productivity, i.e. more goods and services per unit of consumption.

Talking about the economic dimension of environmental problems, it has its origins in two key problems: the fact that the difference between private and social costs of economic activities using natural resources can't be achieved in conditions of laissez-faire, and the link between economic growth and environment which often should be solved through compromise.

Sustainable development must consider organizational culture and the values of business principles, ensuring the needs of the organization, control the risks (economic, social, environmental), while protecting, supporting and enhancing human, natural and financial capital for the future.

Specifically, a company that carries out its activity in terms of sustainable development will ensure that, in everything we make, without neglecting the opportunities arising in different times, we may have an approach and a long-term perspective. Only in this way can real value be created today, which will support sustainable business development for tomorrow.

The central objective of the social dimension of sustainable development is the fair distribution of opportunities between generations. A high level of employment and job quality is the relationship between economic and social dimensions of sustainable development and it can be estimated through the GDP and employment level, the primary macroeconomic indicators, but also through the health of the population index regarded as a reservoir of long-term labour force. (Romanian Government, Ministry of Environment and Sustainable Development - National Strategy for Sustainable Development of Romania Horizons 2013-2020-2030, Bucharest 2008).

Introducing sustainable development policy in a company guarantees the creation of sustainable value (not just immediate) and therefore long-term benefits.

Second, companies that act on the principles of sustainable development are expected to reach

superior performance (even on short and medium term) compared to other companies, due to a higher scrutiny of various types of risks they run.

In the paper we intend to see how the global economic crisis has affected all those parts of sustainable development. Next, we'll briefly emphasize the main coordinates of the crisis whose debut was in 2007.

2. THE MAIN COORDINATES OF THE CRISIS THAT BEGAN IN 2007 AND ITS GLOBALIZATION

1990s crisis warnings had no resonance. Many emerging countries have experienced a series of financial crises with devastating consequences on their economies - we have the example of the crisis "Tequilla" in Mexico, that of East Asia, as well as those of Russia and Ecuador.

S.U.A. is facing a recession but nobody can certainly say in which way will evolve things in the near future and if it'll reach again the 1929 financial crisis proportions. (Krugman, The return of economic decline and crisis of 2008, Public Ed, Bucharest, 2009).

Beyond the timeless nature, the following chart is very suggestive if we start thinking on the very similar beginning of the two U.S. financial crisis from 1929 and 2007.
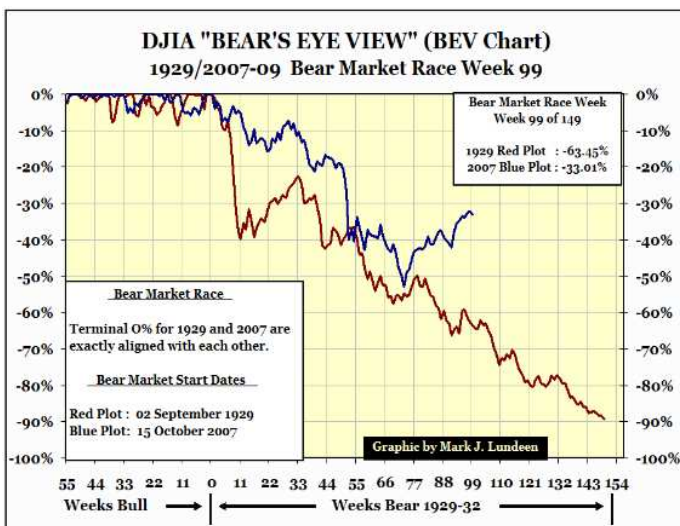

Figure 1 Comparative American DJIA stock index in 1929 and 2007 (http://www.gold-eagle.com)

The first signs of the current crisis occurred since mid 2007, when liquidity problems had affected the American banking system, being necessary a capital infusion of $ 62 billion from the Federal Reserve and 130 billion dollars from the European Central Bank. Soon after, the first bank failures appear.

The main cause of the crisis is considered subprime mortgage loans. Subprime loans are that category of loans that involves a risk, and were granted especially to those who had no opportunity to pay their mortgages, or those who were financially affected by an last payment incident. Subsequently, mortgages were taken by a broker, who, in return for commissions, sold the mortgage to mortgage giants like Fannie Mae and Freddie Mac.

Finally, the assets arrived into the market as bonds bought by investors. Consequently, it was a profitable business for all.

According to MBAA (Mortgage Bankers Association of America) reports the degree of default of these loans was a high one, even so financial institutions have created a variety of similar loans, like:

1) variable-interest loans, generally with a higher interest due to high risk;

2) loans in which only the interest is paid on the first phase;

3) loans with adjustable interest.

The outbreak of the crisis, in June 2007 marked proliferation of substantial financial loss, followed by the fall of the stock exchange, impairment of assets, liquidity crisis, events that led to the collapse of the whole financial system. (Reinhart M. Carmen și Kenneth S. Rogoff, Is the 2007 U.S. Sub-Prime Financial Crisis So Different? An International Historical Comparison, January 2008).

A brief summary of the main causes that created the crisis are: uncertainty and the behaviour of "herd", excessive leverage, inadequate processing maturity, fraud, inadequate regulation and the phenomenon of infecting the system.

Conclusions that we should keep in mind are to focus on crisis prevention. Once a crisis is triggered we can limit it and adopt a mix of economic policies to restore investor confidence. There are no solutions that can be used to help all those affected by the crisis. In order to limit the impact of the crisis, a set of measures must be taken, according to the specific of each country. (Alan Greenspan, Turbulence period: adventures in a new world, Publishing Public Pcs. 2008).

3. FINANCIAL CO-MOVEMENT AND CORRELATION BETWEEN STOCK MARKETS IN THE CONTEXT OF THE CRISIS

Periods of economic crisis cause earthquakes that engage the entire economy, causing reductions in the stock course, the bankruptcy of a large number of

industrial, commercial companies or banks, increasing unemployment and reduced living standards.

A retrospective analysis of the circumstances which led to the crash of the two major American stocks in 1929 and 1987 give a relatively similar image on the economic effervescence that preceded them. Also, the current U.S. financial crisis followed after a period of economic expansion. Without seeking empirical explanations from clichés like "history repeats itself" or "economy is cyclical", it is clear that the impact of the recession has always been greater, the more unexpected it was.

In order to have an integrated financial market, there must be a number of factors: on the one hand the same set of rules, and on the other hand access and equal treatment for all market participants. By analyzing the current state of financial markets we may say that more needs to be done to achieve European integration.

If we make a comparison with the U.S. market, we see that the European capital markets are still fragmented, each with its own trading and settlement system and with its own rules, lacking a pan-European dimension, required by investors with international vocation (see Table 1). Thus, as assessed by the IMF official, Michael Deppler, the fragmented financial market, especially on the segments of retail banking and stock exchange, is responsible for 50% of the difference between the productivity growth in the U.S. versus the one in the E.U. (www.zf.ro,2009).
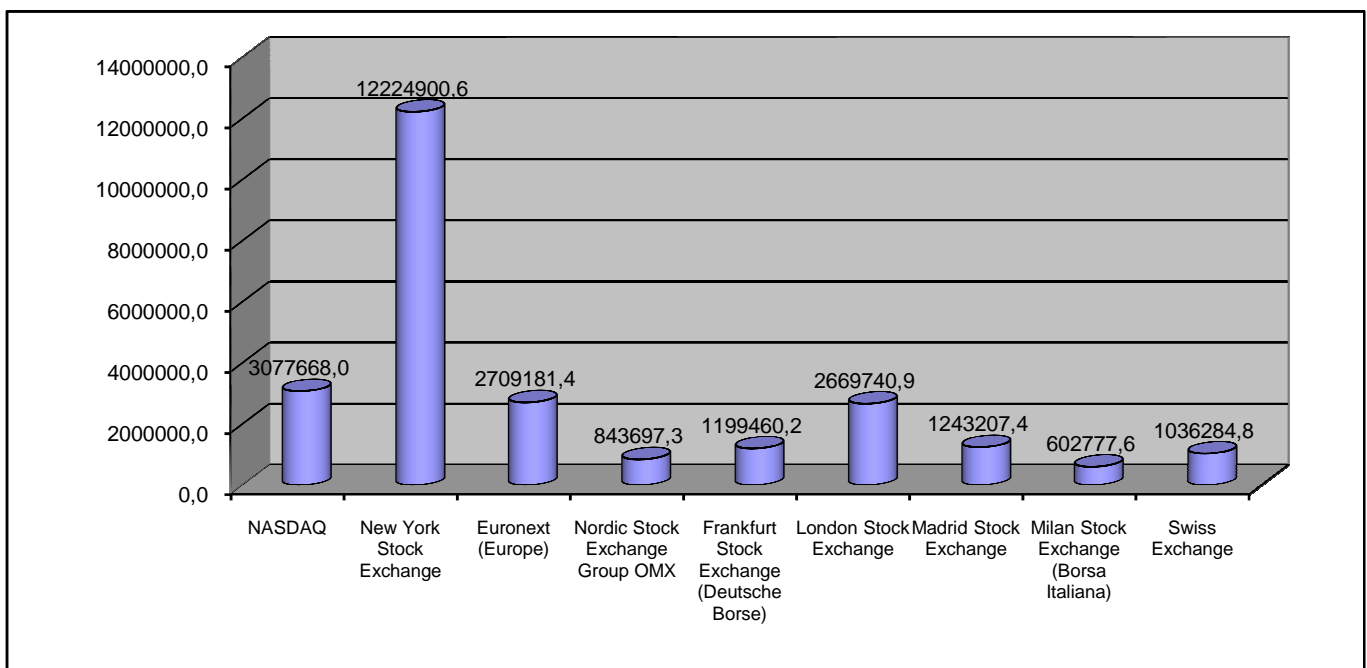

Figure 1. - Domestic market capitalization of the main US and Europe capital markets in January 2010 (millions dollars). Source: World Federation of Exchanges database, 2010, The Year-To-Date monthly statistic, http://www.world-exchanges.org/statistics/ytd-monthly

The market capitalization of a stock exchange is the total number of issued shares of domestic companies, including their several classes, multiplied by their respective prices at a given time. This figure reflects the comprehensive value of the market at that time. In the chart above we can see a greater capitalization of the 2 U.S. share markets (NASDAQ and New York Stock Exchange) as opposed to the 7 major European ones presented.

If we talk about the Bucharest Stock Exchange with a capitalization inferior to those presented in Table 1, we ask the question: What would be the explanation for the collapse of the stock market in Romania long before the current financial crisis was felt on the level of the economy?

As a theoretical substrate, we add the fact that in the field literature, the stock exchange is considered to be the "barometer of the economy" as it indicates the likely development of the capitalist economy, offering significant milestones in their analysis.

The development of the stock market in Romania has long depended on internal factors, such as changing taxation or the macroeconomic climate, but lately we have found a growing interest of investors for how other markets evolve. The existence of a correlation between foreign exchange markets and the one in Romania is discussed more and more frequently.

Some experts say that there can only be an emotional correlation between a very small market

and one characterized by extremely high volumes, as large institutional investors cannot effectively clear the significant packages of shares due to low liquidity and relatively minor value holdings as compared to the ones on the developed markets in the world. As a counterargument, it is claimed that due to globalization, Romania cannot separate from the other states, as Romanian companies are affected by the same factors as those in the U.S. or the U.K., for example.

Prevailing models of capital markets capture a limited form of social influence and information transmission, in which the beliefs and behavior of an investor affect others only through market price, information transmission and processing is simple (without thoughts and feelings), and there is no localization in the influence of an investor on others. In reality, individuals often process verbal arguments obtained in conversation or from media presentations and observe the behavior of others. David Hirshleifer and Siew Hong Teoh (2009) review evidence about how these activities cause beliefs and behaviors to spread and affect financial decisions and market prices and theoretical models of social influence and its effects on capital markets. To reflect how information and investor sentiment are transmitted, thought and behavior contagion should be incorporated into the theory of capital markets.

Another authors (Kent Daniel, David Hirshleifer, Siew Hong Teoh, 2002) pointed out the extensive evidence about how psychological biases affect investor behavior and prices. They examine the evidence of herd behaviour and stock price co-movement within US and Europe market. American economy has been very significant for the whole world. Similarly, the U.S. security market also plays an important role in the global markets.

Milani (2009) argues that even though economists recognized for a long time that psychological forces, changes in markets sentiments and so forth (for example, Keynes in 1936 attributed cycles to the action of "animal spirits") may exert a large influence on economic fluctuations, the current generation of macroeconomic models typically omit them altogether from the analyses. He pointed out that these forces, in the form of exogenous expectational shifts, such as waves of optimism and pessimism, should be brought back to the center of macroeconomics.

4. BACKGROUND OF RESEARCH

The purpose of this study is to investigate how the Romanian stock market behaves on the international financial arena and how it reacts on different inflows of information and economic shocks from the international stock markets.

As we implied earlier, in the last few years there has been a fundamental shift in investor behavior, and the efficient market hypothesis has been increasingly supplanted by behavioral finance (Shiller, 1990). One of the more active areas of research in behavioral finance has been the study of co-movement between asset prices. The traditional view, based on analysis of economies without impediments to arbitrage and with rational investors, is that co-movement in prices reflects co-movement in fundamental values. The alternative view is that in economies with limits to arbitrage and irrational investors, co-movement in prices can also result from the trading patterns of specific groups of investors.

The analysis of common stock market movements is particularly important when assessing financial crises and their contagious effects. The study of common market movements is, however, also interesting in two additional respects. First, there is no clear and unambiguous definition of "co-movement" and no unique measure associated with it. Even the spelling is oscillating between "co-movement" and "comovement". (Baur Dirk, 2003). The only explicit though not sufficient definition of co-movement (comovement) can be found in Barberis et al. (2002): Comovement can be defined as a pattern of positive correlation. This definition is based on the correlation coefficient and does not explicitly describe the meaning of co-movement.

The study of correlations has received a boost by well-publicized crises in emerging markets, which seem to create "excessive" correlations between countries that some have termed "contagion" (Bekaert, Hodrick, Zhang, 2009). An intense debate in the literature centers on the problem of identifying and measuring international financial contagion. Nonetheless, a consensus has appeared among researchers that not only periods of uncertainty but also more tranquil times may be accompanied by excess comovement among asset prices within and across both developed and emerging financial markets (Kallberg and Pasquariello, 2007)

Recessions are characterized by higher economic uncertainty about the future level of real economic activity, a finding that gives a rational explanation to empirical stylized facts that cross-covariances and correlations are higher during recessions (David and Veronesi, 2006). In this case, the belief to be in a boom or recession becomes itself a state-variable so

that the covariance of each asset returns with this state variable would also determine the conditional expected return of the asset (Ribeiro and Veronesi, 2002). Empirical evidence indeed suggests that stock returns on individual portfolios are affected by variables linked to the business cycle (Fama and French, 1989, Lettau and Ludvigson, 2001).

Many of the papers in the extensive literature dealing with financial crises and the propagation of shocks within and across markets use observed increases in correlation as a measure of financial contagion, and analyze whether those increases are due to the irrational propagation of shocks or merely to the surge in the variance of a common source of risk driving returns in the affected markets. This approach, however, does not easily reconcile with the definition of financial contagion as a pervasive feature of capital markets during both tranquil and uncertain times. Indeed, the prevailing view among researchers is that co-movement among asset prices is excessive just when beyond the degree justified by economic fundamentals, i.e., by factors affecting assets' payoffs at liquidation (Kallberg and Pasquariello, 2007).

Trends of stock market volatility appears now to move rapidly across countries and the degree of interdependence between the international equity markets has become an important issues in financial economics. Several studies have concluded that market volatility, integration and volatility transmission have increased in recent years. Most recent studies have found a majority of the equity markets to be interlinked. The causes for this increase are attributed to advance communication systems and information technology, globalization and increasing international trade, trade blocks, deregulation of international financial markets, and exchange rate volatility (Thangavelu, T. Shanmugam, 2009).

Currently, the financial markets are witnessing liberalized capital movements, financial reforms, advances in computer technology and information processing. This trend is evident in both developed and developing countries. These factors have reduced the isolation of domestic markets and increased their ability to react promptly to news and shocks originating from the rest of the world. This indicates that the linkages between stock markets around the world have grown stronger. Hence there is a need to study these linkages and investigated empirically. International linkage of emerging markets has great implications for domestic economies and for international diversification.

The changes in the volatility of stock market returns are capable of having significant effects on risk averse investors and the economy. Basically, changes in volatility in the domestic stock market can impact consumption patterns, corporate capital investment decisions, leverage decisions, the business cycle and macroeconomic variables of that country (Lakshmi and Gamini, 2004). These issues are significant because of the wide and varying impact that stock market volatility has on the world economy as movements in the stock market can influence several economic factors, such as consumption, capital investment and can adversely affect real economic activity. Besides the impact on world economy, the effect can be seen at an individual level too. High volatility in financial asset returns (where volatility is beyond a certain threshold) increases the risk of loss to individual investors and, therefore, raises concern about market stability (Thangavelu, T. Shanmugam, 2009).

International stock prices are correlated for many reasons (Thangavelu, T. Shanmugam, 2009). First, the different stock markets may be influenced by the same macroeconomic variables, such as trade linkages between countries or booms and recessions in one country spilling over to other countries. For instance, the rise in an interest rate of one country, caused by high inflation, would lead to immediate fluctuations or interest rate movements in another country. The stock market returns in these two markets would be affected by this potential rise in the interest rate, causing stock prices to fall due to two well-known facts. An increase in interest rate makes it more attractive for investors to move their money away from stocks to other financial instruments such as bonds. In addition, the firms would face higher financial costs on their debt, which leads to a reduced cash flow (Durre and Giot, 2005). Second, improved communication technology and the internet increased the speed of dissemination of news across the globe. Another contributing factor to markets' co-movement is the higher degree of cooperation among national governments in recent years and the removal of trade barriers which prevented the flow of goods, services, and capital. This internationalization process has been evident in Europe and Asia, where the economic and financial structures have undergone extensive changes in the recent years. There has been a rapid development of the financial markets, which has been reinforced since the stock market crash of 1987. These factors are assumed to lead to a higher degree of co-movements among the stock markets in the world.

5. RESEARCH DATA

The study investigates the co-movement of the Romanian market with major stock markets in the world. Every country has a stock market either with a single or multiple Stock Exchanges. The most regularly quoted market indices are national indices composed of the stocks of large companies listed on a nation's largest stock exchanges. We use weekly data that range from January 1, 2007 to March 17, 2010, which includes 167 observations on the most relevant stock indices of US, UK, Germany, France, Swiss, Spain and Romania. The specific reason to choose the time-frame was to analyze the co-movement between the selected stock markets from the beginning of the crises towards nowadays.

A brief information of stock markets indices chosen in this study is given hereon (source: Bloomberg):

Table 1.

Indices	Purpose
The Dow Jones Composite Average (DJA)	is a price-weighted average that tracks 65 U.S. prominent companies. The average is a combination of the Dow Jones Industrial, Transportation, and Utilities Averages.
The FTSE 100 Index (FTSE-100)	is a capitalization-weighted index of the 100 most highly capitalized companies traded on the London Stock Exchange. The equities use an investibility weighting in the index calculation. The index was developed with a base level of 1000 as of January 3, 1984.
The German Stock Index (DAX)	is a total return index of 30 selected German blue chip stocks traded on the Frankfurt Stock Exchange. The equities use free float shares in the index calculation. The DAX has a base value of 1,000 as of December 31, 1987. As of June 18, 1999 only XETRA equity prices are used to calculate all DAX indices.
The CAC-40 Index (CAC-40)	is a narrow-based, modified capitalization-weighted index of 40 companies listed on the Paris Bourse. The index was developed with a base level of 1,000 as of December 31, 1987. As of December 1, 2003 the index has become a free float weighted index.
The Swiss Market Index (SMI)	is a capitalization-weighted index of the 20 largest and most liquid stocks of the SPI universe. It represents about 85% of the free- float market capitalization of the Swiss equity market. The SMI was developed with a base value of 1,500 as of June 30, 1988.
The Madrid Stock Exchange General Index (SMSI)	is a capitalization-weighted index that measures the performance of a selected number of Continuous Market stocks. The index was developed with a base value of 100 as of December 31, 1985.
Bucharest Exchange Trading – Composite Index (BET-C)	is the composite index of BVB market. It is a market capitalization weighted index. BET-C reflects the price movement of all the companies listed on the BVB regulated market, I-st and II-nd Category, excepting the SIFs.

We paid attention to the operations timing of each market, in order to see the overlapping of hours in the selected and its implication towards Romanian market. Because the operations timing of the Bucharest Stock Exchange overlaps with the exchanges in US, shocks from the US markets do not overlap with the Romanian market on the same day but gives effect the following day. That is the reason for which we used in our analyses the values of BET-C every following day of the ones used for US DJA.

6. CORRELATION ANALYSIS

On a more statistical note, the correlation matrix and coefficients for the stock markets was obtained to examine the degree of correlation between the selected markets. According to Janakiramanan and Lamba (1998), when countries share geographical proximity and have similar groups of investors in their markets, these markets are more than likely to influence each other. The more dominant market is likely to exert greater influence on the relatively smaller market.

From the tables, the US market has a significant correlation with all the markets at a 1% level of significance.

Besides the correlation with US market (with a correlation coefficient of 0,944), the Romanian market has a significant correlation with European capital markets (with a coefficient of 0.961 with France and of 0.960 with Germany).

From the analyses, the US market seems to have the most significant impact upon German market (the correlation coefficient is 0,965) and the least impact (although the correlation is still high) upon Swiss Market.

In Europe, the German market has the most significant impact upon UK market (the correlation coefficient is 0,976) and the least impact (although the correlation is still high) upon Swiss Market.

Particularly relevant is also the graphical evolution of the indices in Europe analyzed in this paper over a period of five years, since they reflect the chronological similarity compared to U.S. crisis, but also the amplitude of the casualties recorded.

On comparison, the movement of US and European stock price indices shows similar trends and pattern and this is substantiated by the significant correlation discussed earlier. Nevertheless all market indices exhibits a consistent dip or downward trend after 2007 and this is supported by the global economic crisis.

The first half of 2007 shows an upward trend for the BET-C parameter, registering sustained growth, despite the existence of significant negative fluctuations.
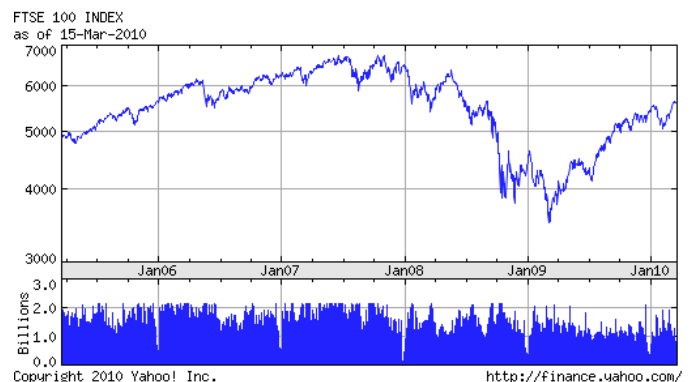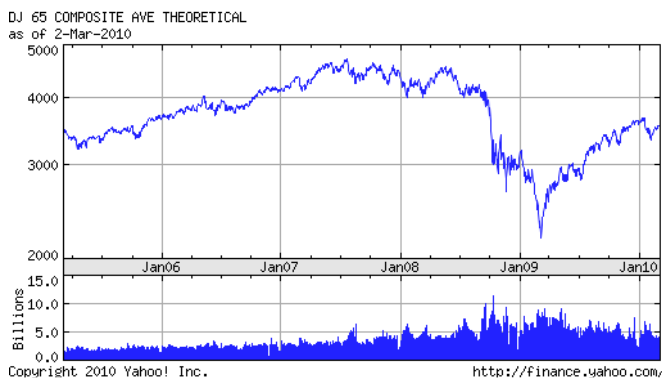
August 2007 marked the installation of a decreasing trend, correlated with the onset of the U.S. mortgage crisis, which continued until the end of March 2009. Although it seems hard to believe, the year 2008 represented to the Bucharest Stock Exchange, and by default to the evolution of the indices BET, BET-C and BET-FI, the occurrence of exponential decline, which were difficult to predict, beyond the level of 70% for BET, and of 80%, if we refer to the BET-FI. However, as seen in the charts below, the course of the stocks tends to recover, thus registering upward trends regarding the analyzed indices, since April 2009.

Table 2. Correlation Coefficients Between weekly capital market indices values from 01.2007-03.2010
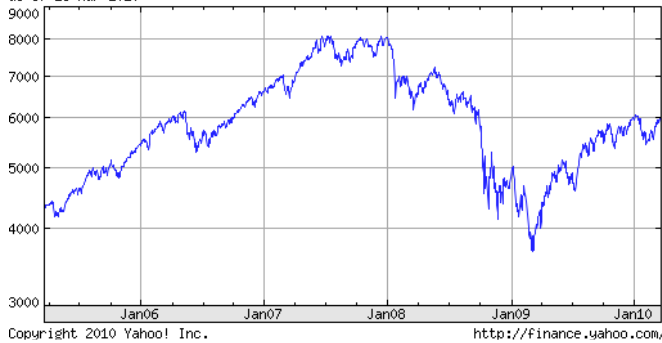
Correlations

		DJA	DAX	FTSE	CAC	SMI	SMSI	BETC
DJA	Pearson Correlation	1	.965**	.962**	.950**	.928**	.946**	.944**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	167	167	167	167	167	167	167
DAX	Pearson Correlation	.965**	1	.976**	.966**	.940**	.970**	.960**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	167	167	167	167	167	167	167
FTSE	Pearson Correlation	.962**	.976**	1	.972**	.962**	.978**	.932**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	167	167	167	167	167	167	167
CAC	Pearson Correlation	.950**	.966**	.972**	1	.989**	.981**	.961**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	167	167	167	167	167	167	167
SMI	Pearson Correlation	.928**	.940**	.962**	.989**	1	.968**	.938**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	167	167	167	167	167	167	167
SMSI	Pearson Correlation	.946**	.970**	.978**	.981**	.968**	1	.947**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	167	167	167	167	167	167	167
BETC	Pearson Correlation	.944**	.960**	.932**	.961**	.938**	.947**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	167	167	167	167	167	167	167

**. Correlation is significant at the 0.01 level (2-tailed).

DJ 65 COMPOSITE AVE THEORETICAL
as of 2-Mar-2010
Copyright 2010 Yahoo! Inc.   http://finance.yahoo.com/

FTSE 100 INDEX
as of 15-Mar-2010
Copyright 2010 Yahoo! Inc.   http://finance.yahoo.com/

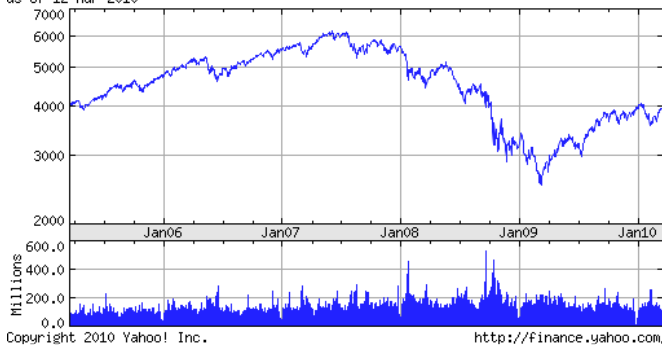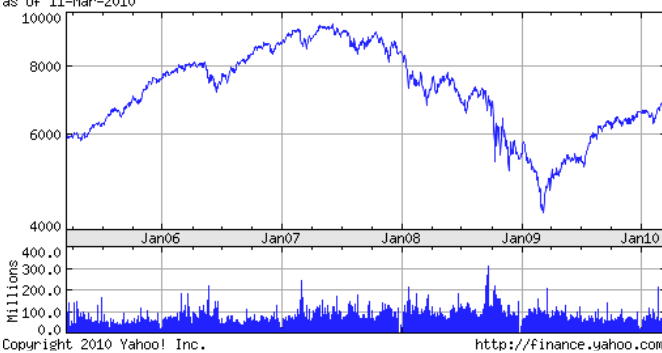GERMANY DAX INDEX
as of 16-Mar-2010

FRANCE CAC-40 INDEX
as of 12-Mar-2010

SWISS MARKET INDEX
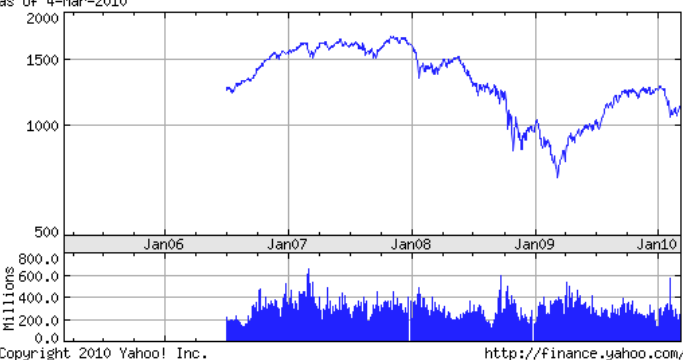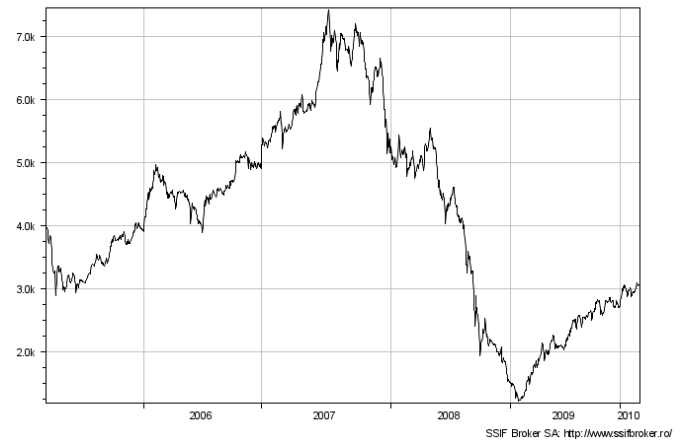as of 11-Mar-2010

MADRID GEN INDEX (MADRID STOCK
as of 4-Mar-2010

Chart BET-C line week 2005-03-17 - 2010-03-17

7. CONCLUSIONS

As the globalization spreads out through the world, not only the developed countries, but also the developing countries' financial markets become interconnected. Moreover, when the financial markets move together, this might lead to contagion (Dornbusch, Park and Claessens, 2000). To be able to say that markets are contagious, they must move together more significantly during the crisis than during the stable time. Otherwise, if no co-movement significantly, the market correlation might only mean the interdependence between the two economies (Aktar Ismail, 2009).

On comparison, the movement of US and European stock price indices shows similar trends and pattern and this is substantiated by the significant correlation. Romanian stock price indices do have comparing movements with the US stock market and it has been statistically proven to be correlated, too. Nevertheless all market indices exhibits a consistent dip or downward trend after 2007 and this is supported by the global economic crisis.

Linking the stock exchange market in Romania with the markets in the developed countries of the world, but mainly with the U.S. one, is one of the most common justifications offered by brokers on the strong decline registered by the local market over the previous year. However, in the opinion of some analysts, the downward evolution of Romanian stock exchange cannot be explained only in relation to this correlation, because most companies listed on BSE reported at that time growing results, i.e. in contrast to the situation in which American companies found themselves.

More specifically, in the context of an economic growth of around 8% in 2008, of the recent accession to the European Union, of an impressive ascent of companies listed on stock exchanges and of the optimistic economic forecasts, the stock market fell by over 50%. This paradox is explained

not by the lack of correlation between the real economy in Romania and the stock market, but by the fact that the economic decline had been anticipated long before it occurred.

Interestingly, in this context, psychological factors have affected the behavior of the Romanian investor, reflected in the stock market index values. Basically, starting from the fact that the American economy has been very significant for the whole world and the U.S. security market plays an important role in the global markets, we may conclude that the Romanian investors on capital markets have "imported" the crisis through the financial investment channel, even if the economic crisis had not yet been felt.

The study is limited to the analysis of co-movement between Romanian stock market against US, UK, Germany, France, Switzerland and Spain between the time frame of crises beginning (2007) to nowadays (march 2010). A more comprehensive study on the nature of volatility co-movements of Romanian stock market should include other stock markets around the world to better understand the dynamics of other stock markets ramifications' on the Romanian stock market.

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