

## **RECENT EMERGING AND DEVELOPED EUROPEAN STOCK MARKETS VOLATILITY OF RETURNS**

**Chiaku Chukwuogor**

*Eastern Connecticut State University, USA.*

*nduc@easternct.edu*

**Mete Feridun**

*Loughborough University, UK.*

*E-mail: mete.feridun@gmail.com*

### **ABSTRACT**

This paper examines the volatility of returns in fifteen emerging and developed European stock markets. A set of parametric and non-parametric tests is used to test the equality of mean returns and standard deviations of the returns. Results suggest that there was generally high volatility of returns in the markets during the period 1997-2004 and that there were some surprises in terms of volatility and loss of value in the case of some developed European stock markets. The emerging markets in general had higher returns and higher volatilities, particularly Russia and Turkey. Even though the markets of Russia, Turkey and Spain showed the highest standard deviations, the markets that displayed the highest coefficients of variation are those of Austria, Belgium, Czech Republic, Denmark, France, Germany, Italy, Switzerland and Turkey. The results of the *Levene's* (1960) could not reject the Null Hypothesis that mean returns are equal across the days of the week for all the markets except for Italy.

**Key words:** returns, volatility, standard deviation, emerging, developed

**JEL Classification code:** G14, G15

## I. INTRODUCTION

An understanding of volatility in stock markets is important for determining the cost of capital and for assessing investment and leverage decisions as volatility quantifies the risk of the stock market. Substantial changes in volatility of stock markets' returns can have significant negative effects on risk averse investors. In the face of global integration of financial markets, challenges posed by emerging transition economies and possible benefits of regional integration, there is great need to constantly determine the characteristics of both the developed and emerging European markets. Investment opportunities can therefore arise from this abnormal behavior and portfolio managers may want to rebalance their portfolios from one market to another as the risk reduction envisaged depends on the negative correlation of stock markets return and volatility. Other financial professionals, such as risk managers, need to have a thorough understanding of how markets behave so that they can develop effective strategies for hedging against economic shocks. There exists a broad literature on the research done on stock market volatility in the stock markets all around the world. However, there exists no study that addresses the emerging and developed markets' status in terms of volatility in stock returns in Europe. Almost all of the literature focuses on a group of intercontinental countries. For instance, Eun and Shim (1989) analyzed daily stock market returns of Australia, Hong Kong, Japan, France, Canada, Switzerland, Germany, US and the UK; whereas, Ng (2000) examines the magnitude and changing nature of volatility spillovers from Japan and the US to six Pacific-Basin equity markets.

A few studies, such as Steely and Steely (1999), Gerrits and Yuce (1999), Yang et al. (2003), Syriopoulos (2004) and Apolinario et al (2006) studied European markets in general, and a few such as Jochum et al. (1999), Dockery and Vergari (2001), MacDonald (2001),

Gilmore and McManus (2002) focused on the Central Eastern countries. To our knowledge, there exists no study focusing on the period 1997-2004 and covering both the developed and emerging European markets including Central Eastern European countries. This period 1997-2004 not only represents the period of the highest occurrence of financial crises in the world in recent times, it also encapsulates some of the pre and post euro introduction period.

Therefore, the present study aims at filling this gap in the literature and to contribute to this area by examining volatility in developed and emerging European stock markets namely Austria; Belgium; Czech Republic; Denmark; Germany; France; Italy; Netherlands; Russia; Slovakia; Spain; Sweden; Turkey; Switzerland and the United Kingdom through a set of parametric and non-parametric tests, namely *Kruskal-Wallis*, *Bartlett's* and *Levene's* (1960). A study of a number of stock markets facilitates comparisons, thus allowing identification of similarities and differences.

In 2004 EU officially enlarged to include several former Central Eastern European countries that until a little more than a decade ago seemed to be a world apart. In this area, the stock markets of the Czech Republic and Slovakia are considered the most developed, in terms of capitalization, turnover and number of traded securities Hanousek and Filer (2000). During the process of enlargement these countries had to adapt their legislation to the Western standard, respecting the rules and introducing new economic ethos in their financial markets. As stock markets have gained a dominant role in equity funding and portfolio allocation decisions, research examining volatility in stock markets has gained importance. The presence of strong economic ties and policy coordination in the European markets can indirectly link stock price behavior over time. Volatility in stock markets has important regional and global implications, as a domestic economy cannot be insulated from external shocks. In the period 1997 to 2004, ten indexes in our sample registered positive growth, and they are ATX (Austria) 87.8 percent; BEL 20 Index (Belgium) 21.3 percent; DX 50, (Czech Republic) 108.4 percent; KFX 20 (Denmark) 36.15 percent; CAC 40 (France) 27.4 percent; DAX (Germany) 75 percent; MBTEL (Italy) 40 percent; MTM (Russia) 836.3 percent; SXAXPI (Sweden) 29 percent; and XU 100 (Turkey) 623.6

percent. Foreign direct investment and portfolio investment flows to the euro area in anticipation of the introduction of the euro in 1999 may partially account for this growth. The increasing trend of financial integration within the EU and several non-member states may also partially account for this observed growth. Also, some of the capital that left US markets after the September 11, 2001 attacks possibly found a more secure investment atmosphere in Europe. The European Union regulations and monitoring have reformed the stock markets, improving their operational efficiency and increasing their returns.

The Russian MTM and the Turkish XU 100 registered astronomical growth. The high returns in the Turkish stock market can be attributed to the financial and political stability achieved in the country, especially due to the fact that the country has been accepted as a candidate country for the EU.

Among the indexes that lost value during the period are AEX (Netherlands) -16 percent; SAX (Slovakia) -3.2 percent; SMSI (Spain) -4.9 percent; SSMI (Switzerland) -9.1 percent; and FTSE 100 (UK) -6.3 percent. Annual closing index values, annual percentage changes and period percentage changes of the EFM for the period January 2<sup>nd</sup> 1997-December 31<sup>st</sup>, 2004 are shown in Table 1.

Although positive annual index closing price changes were the norm between 1997 and 2004, many of the European indexes experienced negative changes especially in 1998 and 2002. The indexes of the following countries experienced negative changes exceeding 20 percent: Russia, -55.97 percent in 1998; Germany, -43.94 percent in 2002; Turkey, -37.95 percent in 2000, -24.76 percent in 2002, -24.72 percent in 1998; Sweden, -37.43 percent in 2002; Netherlands, -36.32 percent in 2002, -20.52 percent in 2001; France, -33.75 percent in 2002, -21.97 percent in 2001; Switzerland, -27.84 percent in 2002, -21.11 percent in 2001; Belgium, -27.21 percent in 2002; Denmark, -26.78 percent in 2002; United Kingdom, -24.48 percent in 2002; Spain, -23.1 percent in 2002; Italy, -23.34 percent in 2002; and Czech Republic, -20.41 percent in 1998.

**Table1. Annual Closing Index Values, Annual percentage Changes and Period Percentage Changes of the EFM (January 2nd 1997- December 31st, 2004)**

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	Period % change*
ATX, Austria	1140	1295	1122	1197	1073	1140	1150	1545	2431	87.8
Annual % changes	na	13.57	-13.45	6.87	-10.40	6.25	0.85	34.36	57.36	
BEL 20 Index Belgium	1896	2418	3515	3340	3024	2782	2025	2244	2933	21.3
Annual % changes	na	27.59	45.32	-4.95	-9.46	-8.02	-27.21	10.82	30.68	
DX 50, Czech Republic	na	495	394	490	4790	395	461	660	1032	108.4
Annual % changes		na	-20.41	24.23	-2.29	-17.53	16.75	43.06	56.58	
KFX20 Denmark	136	211	219	256	314	272	199	244	287	36.15
Annual %changes		54.67	4.17	16.57	22.77	-13.20	-26.78	22.49	17.32	
CAC40, France	2316	2999	3943	5958	5926	4625	3064	3558	3821	27.4
Annual %changes		29.50	31.47	51.12	-0.54	-21.97	-33.75	16.12	7.40	
DAX, Germany	2889	4224	5002	6958	6434	5160	2893	3965	4256	.75
Annual % changes		46.24	18.42	39.10	-7.54	-19.79	-43.94	37.08	7.34	
MBTEL, Italy	10571	16806	23695	28976	30323	22808	17485	19922	23534	40
Annual % changes		58.98	40.99	22.29	4.65	-24.78	-23.34	13.94	18.13	
AEX, Netherlands	294	415	538	671	638	507	323	338	348	-16
Annual % changes	na	40.95	29.85	24.71	-5.04	-20.52	-36.32	4.62	3.09	
MTM, Russia		812	357	1424	1524	2954	4354	6612	7600	836.3
Annual % changes		na	-55.97	298.47	7.04	93.80	47.40	51.85	14.95	
SAX, Slovakia	na	182	94	77	92	121	140	177	na	-3.2
Annual % changes		na	-48.49	-18.01	19.24	31.41	15.90	26.18		
SMSI, Spain	na	na	800	1009	881	824	634	808	959	-4.9
Annual %changes		na	na	na	-12.68	-6.39	-23.10	27.44	18.70	
SXAXPI, Sweden	139	177	196	327	288	239	150	194	228	29
Annual %changes		27.03	10.86	66.47	-11.96	-16.88	-37.43	29.82	17.63	
XU 100, Turkey	na	3451	2598	15209	9437	13783	10370	18625	24972	623.6
Annual % changes		na	-24.72	485.41	-37.95	46.05	-24.76	79.60	34.08	
SSMI, Switzerland	3942	6266	7161	7570	8135	6418	4631	5488	5693	-9.1
Annual % changes		58.93	14.29	5.72	7.47	-21.11	-27.84	18.51	3.74	
FTSE 100, UK	4119	5136	5883	6930	6223	5217	3940	4477	4814	-6.3
Annual % changes		24.69	14.55	17.81	-10.21	-16.15	-24.48	13.62	7.54	

\* in closing values

The rest of the paper is structured as follows: Section II introduces the data used and explains the methodology followed. Section III presents the results that emerge from the study and Section IV analysis the findings of the study. The last section concludes the paper and discusses the possible implications for practitioners and policy makers.

## II. DATA AND METHODOLOGY

We use the annual percentage changes in the end of year closing values of the European financial market indexes for the period 1997-2004 to determine the annual financial market trends. We further use the daily closing values of the fifteen European financial markets indices from January 2<sup>nd</sup>, 1997 to December 31st 2004 to

determine the daily returns and volatility of returns. The financial markets studied are Austria, Belgium, Czech Republic, Denmark, Germany, France, Italy, Netherlands, Russia, Slovakia, Spain, Sweden, Turkey, Switzerland and United Kingdom. We classify these countries into developed and emerging markets based on the classification suggested by Standard and Poor's Credit Ratings Report by Hessel (2006).

The expression "emerging markets" is commonly used to describe industrializing or emerging countries of the world. Such countries are considered to be in a transitional phase between developing and developed status, or are defined as an economy with low-to-middle per capita income and are usually considered emerging because of their developments and reforms. Emerging European countries are particularly characterized as transitional, i.e. they are in the process of moving from a closed to an open market economy such as the former Soviet Union such as Russia and Eastern bloc countries such as Slovakia and Czech Republic. As an emerging market, a country is at the same time embarking on an economic reform program that will lead it to stronger and more responsible economic performance levels, as well as transparency and efficiency in the capital market. One of the primary examples in Europe in this respect is Turkey. Table 2 indicates the countries considered in the present study and the indices used to measure volatility.

**Table 2 Emerging and Developed Countries Studied\***

<b>Developed Countries</b>		<b>Developing Countries</b>	
<b>Country</b>	<b>Index</b>	<b>Country</b>	<b>Index</b>
<b>Austria</b>	<b>ATX</b>	<b>Czech Republic</b>	<b>DX 50</b>
<b>Belgium</b>	<b>BEL 20</b>	<b>Slovakia</b>	<b>SAX</b>
<b>Denmark</b>	<b>KFX 20</b>	<b>Turkey</b>	<b>XU 100</b>
<b>France</b>	<b>CAC 40</b>	<b>Russia</b>	<b>MTM</b>
<b>Netherlands</b>	<b>AEX</b>		
<b>Spain</b>	<b>SMSI</b>		
<b>Sweden</b>	<b>SXAXPI</b>		
<b>Switzerland</b>	<b>SSMI</b>		
<b>United Kingdom</b>	<b>FTSE 100</b>		
<b>Germany</b>	<b>DAX</b>		
<b>Italy</b>	<b>MBTEL</b>		

\* Countries are classified based on Hessel (2006)

The daily stock returns for these EFM stock indices are calculated as follows:

$$\ln(P_t/P_{t-1}) * 100 \quad (1)$$

Where  $P_t$  is the stock index at date  $t$ . Except for the returns on Monday, any returns that are preceded by a holiday were excluded. This exclusion as was done in previous studies to avoid speculation that observed day-of-the-week-effect could be partially due to these non-trading days. To determine the nature of the volatility of returns, the distributions of daily returns are analyzed using such measures as variance, standard deviations, kurtosis, skewness and coefficient of variation. The results were substantiated by parametric and non-parametric tests.

The daily returns were tested for normality using the *Shapiro-Wilk* test. Since the result of the normality test indicates that the distributions of the returns are non normal, we use the non-parametric test, the *Kruskal-Wallis* to check the results for equality of mean returns. The *Kruskal-Wallis* statistic is as follows:

$$\frac{12}{N(N+1)} \sum_{j=1}^k \frac{R_j^2}{n_j} - 3(n+1) \quad (2)$$

Where:  $k$  = number of samples;  $n_j$  = number of values in  $j^{\text{th}}$  sample;  $N = \sum n_j$  = total number of values;  $R_j$  = sum of ranks in the sample when  $N$  values are ranked together (the statistic is approximately Chi-square distributed degrees of freedom equal to  $k-1$ ). To test for the equality of variance across the days of the week, we employ the *Bartlett's* homogeneity test. The test criterion is as follows (Snedecor and Cochran, 1970)

$$M = v \left( a \ln s^{-2} - \sum \ln s_i^2 \right) \quad (3)$$

Where  $a$  = the number of samples;  $v$  = degree of freedom;

$s^{-2} = \sum s_i^2 / a$ ;  $s_j^2$  = estimate of the  $\sigma^2$  from sample, then, the quantity  $M/C$  is distributed approximately as a Chi-square distribution with degrees of freedom equal to  $(a-1)$ .

The above test is for the case when all groups have the same degrees of freedom. When the degrees of freedom differ, as with samples of unequal sizes, the test criterion is as follows:

$$M = \left( \sum V_i \right) \ln s - \sum \left( v_i \ln s_i^2 \right) \quad (4)$$

$$C = 1 + \left\{ \frac{1}{[3(a-1)]} \right\} \left( \sum \frac{1}{v_i} - \frac{1}{\sum v_i} \right) \quad (5)$$

Where  $s^2 = \sum (v_i s_i^2) / \sum v_i$ ,  $s_i^2$  is an estimate of the  $\sigma^2$  from sample I,  $a =$  the number of samples,  $v_i =$  the degree of freedom of samples  $i$ . The quantity  $M/C$  is distributed approximately as a Chi-square with degrees of freedom equal to  $(a-1)$ . In our case, as we have five weekdays in a week, degrees of freedom are four.

However, as *Bartlett's* test of homogeneity of variance is sensitive to non normality in stock return distribution, the *Levene's* (1960) test is also employed to check the results on equality of variance. In measuring the variation within a class, *Levene's* test uses the average of the absolute deviations instead of the mean square of deviations. This avoidance of squaring makes the test criterion much less sensitive to non-normal distributions Snedecor and Cochran (1976). The *Levene's* statistic is as follows:

$$F = \left[ \frac{\sum_{j=1}^J n_j (D_{.j} - D_{..})^2}{\sum_{j=1}^J \sum_{i=1}^{n_j} (D_{ij} - D_{.j})^2} \right] \times \left[ \frac{(N - J)}{(J - 1)} \right] \quad (6)$$

Where  $D_{ij} = |R_{ij} - M_{.j}|$ ,  $R_{ij}$  is the return for week I and weekday  $j$  for  $j = 1, 2, \dots, J$  and  $J = 5$  if the last trading day of the week is a Friday. As a result of the *Bartlett's* test of homogeneity of variance sensitivity to non normality in stock return distribution, we rely more on the *Levene's* test results in arriving at our conclusions.

### III. EMPIRICAL FINDINGS

There was generally high volatility of returns in the European markets. The returns were generally skewed to the left. The daily returns exhibited greatest volatility on Monday for eleven of the markets namely Austria, Denmark, France, Germany, Italy, Netherlands, Slovakia, Sweden, Turkey, Switzerland and UK. The markets with the highest standard deviations are those of Russia,



Turkey and Spain. However the markets of Austria, Belgium, Czech Republic, Denmark, France, Germany, Italy, Switzerland and Turkey showed huge coefficients of variation. The coefficients of variation of the stock markets' returns of these countries were: Netherlands - 66405.66 on Thursday; Belgium 37857.20 on Wednesday; Slovakia

Table 3 Empirical Results (January 2nd 1997- December 31st, 2004)

Countries	Kruskal-Wallis		W Test		Levene's Test		Bartlett's Test	
	Chi-square	P Value	Statistics	R	Statistics	P Value	Statistics	P Value
ATX, Austria	2.49	0.647	0.4449	0.978	2.77	0.026	14.17	0.007
BEL 20 Index, Belgium	0.28	0.991	5.056	0.178	0.69	0.595	7758.11	0.000
DX 50, Czech Republic	1.85	0.763	0.5898	0.994	1.56	0.18	9.02	0.061
KFX 20 Index Denmark	0.36	0.966	0.4813	.988	2.95	0.019	25.91	0.000
DAX , Germany	4.82	0.306	0.6486	0.979	3.81	0.004	31.04	0.000
CAC 40, France	1.46	0.834	0.6111	0.987	3.10	0.015	29.52	0.000
MBTEL, Italy	7.86	0.097	0.6154	0.982	5.63	0.000	61.42	0.000
AEX, Netherlands	10.53	0.032	0.6250	0.970	3.29	0.011	35.28	0.000
MTM, Russia;	9.13	0.058	1.669	0.929	2.46	0.044	84.86	0.000
SAX Slovakia	10.38	0.034	0.6844	0.057	2.75	0.027	33.64	0.000
SMSI, Spain	7.09	0.131	7.731	0.200	0.73	0.573	3684.28	0.000
SXAXPI, Sweden	10.77	0.029	0.6493	0.988	1.76	0.134	22.51	0.000
XU 100, Turkey	24.94	0.000	1.521	0.981	2.56	0.037	14.74	0.005
SSMI, Switzerland	0.95	0.917	0.5221	0.973	4.51	0.001	40.81	0.000
FTSE 100, United Kingdom	6.77	0.149	0.4627	0.974	2.12	0.076	20.88	0.000

18606.52 on Friday; and Turkey 12868.61 on Wednesday. The generally observed low daily returns of the indexes with lower standard deviation of returns can partially account for this except in the case of Turkey. The basic statistics of the indexes are contained on Tables 1 to 15 in the Appendix. The results of the *Levene's* (1960) test of the equality standard deviations of the returns at the 5 percent confidence level could not reject the Null Hypothesis that mean returns are equal across the days of the week for all the markets except for MBTEL, Italy. The results of the *Levene's* test are shown in Table 3.

#### IV. ANALYSIS OF THE FINDINGS

Results suggest that there was generally high volatility of returns in the markets during the period 1997-2004. In spite of the

widely accepted notion that emerging economies are more volatile than established markets, findings of the present study suggest that the results of the *Levene's* (1960) could not reject the Null Hypothesis that mean returns are equal across the days of the week for all the markets except for Italy. That means that the volatility of the returns of the MBTEL, Italy was the only one that was statistically significant. Results suggest that there was generally high volatility of returns in the markets during the period 1997-2004 and that there were some surprises in terms of volatility and loss of value in the case of some developed European stock markets. Nevertheless, the emerging markets in general had higher observed returns and volatilities, particularly Russia and Turkey. As the findings clearly indicate, even though the markets of Russia, Turkey and Spain showed the highest standard deviations, the markets that displayed the highest coefficients of variation are those of Austria, Belgium, Czech Republic, Denmark, France, Germany, Italy, Switzerland and Turkey. The generally low returns for these markets, except in the case of Turkey may be partially responsible for this observation.

Integration of the European financial markets and institutions, liberalization of related laws and regulations, increasing linkages between sub-segments of financial markets and introduction of new instruments and innovative derivatives have lead to the transmission of high price volatility of stocks from one country to another within Europe. Therefore, the reason of volatility in the European financial markets, in general, may be the openness of economies and higher exchange rate stability maintained among the member countries within the EU. Especially in the last few years, financial integration appears to be a major issue in the EU as several policy initiatives have been launched to obtain financial integration. Presumably, the introduction of the euro has worked in favor of financial integration. Since volatilities are linked via information spillover, introduction of the euro did not bring a net benefit in terms of a reduction in the characteristic volatility of the emerging European markets.

Nevertheless, there are many other factors that might have contributed to this volatility such as the choice of monetary policy and the exchange rate regime, central bank independence, levels of output, income, inflation, and uncertainty within the political scene.

The degree of the impact of each of these factors varies and depends on a particular country's economic and, to a great extent, political condition. Unpredictable circumstances, in particular, affect all real variables as well as asset yields. In stock markets even trivial information, often not even valid, might cause huge movements of stock prices. Emergence of financial crises, in particular, such as the ones in Turkey in 1994, 1998 and 2001; Czech Republic in 1997, Russia in (1997) may have also played a role in the volatility of the stock markets returns in these countries.

In Turkey, for instance, both political and economic factors have contributed to volatility. For a long time, Turkey had suffered from political instability and the military intervention in the politics. After the 1995 elections, in particular, there was a period of political instability, during which the main Islamist party participated in Government for the first time. The following general elections in April 1999, on the other hand, led to the formation of an unpredicted three party coalition. These coalition parties had considerable differences in terms of their ideologies, which contributed to the political instability in the country Feridun (2004). In addition to the political instability, a high and fluctuating inflation had been one of the key features of the economy. Throughout the second half of the 1990s, inflation continued to fluctuate within a 70 to 100% range. However, after the introduction of the 1999 Disinflation and Fiscal Adjustment Program and the three-year stand-by agreement signed with the IMF, inflation dropped significantly Feridun (2005a). For these reasons, Turkey has always been a prime example of a striking link between political instability and economic volatility.

In Russia also, adverse domestic political developments and weak commodity prices, as well as global economic events have played a role in the volatility. Particularly in late 1990s, growing burden of borrowing and concerns about the country's default on its treasury bills caused a loss in the investors' confidence and subsequent high degrees of volatility Feridun (2005b). In particular, the rapid decline in the prices of the country's two most valuable sources of capital flows, energy and metals in late 1990s due to the East Asian financial crisis and its contagion effects, resulted in an economic chaos in the country Chiodo and Owyang (2002).

During the same period Slovakia and Czech Republic could escape from attacks on their currencies as they happened to be outside the chain-reaction zone of global contagion Kazunari and Honebon (1999). Especially, Czech Republic, which underwent a currency attack in late 1990s due to delay of structural reforms, weathered the crisis despite its fragile fundamentals. This also reinforces the view that stresses market sentiment over economic fundamentals. According to this view, attacks on currencies are triggered by changes in the market sentiment, and failure to defend a currency may develop into a self-realizing collapse of the market with no bearing on fundamentals (Kazunari and Honebon, 1999).

In Czech Republic and Slovakia, since the fiscal conditions were relatively gentle immediately after independence, fiscal reforms did not attract adequate attention from the policy makers. As a result, the efficiency and competitiveness of the private sector had not improved, which led to the non-performing loan problem, and the increase in external and fiscal deficits. The stock market was definitely affected with these problems Kazunari and Honebon, (1999).

During this period, stock markets around the world were falling because they feared that the slowdown in the economies of Japan and the United States could become global, hurting company earnings. Many multinational companies trade around the world, and are bound to be affected by problems in the world's two biggest economies. Fears were particularly related to Japan where many big banks were in trouble and were expected to go bankrupt. These fears were particularly dominant in the UK and Dutch markets as Japanese banks had large investments in these markets among other markets. Besides, during this period, there was a big loss in the value of companies whose shares are listed on America's NASDAQ and Technology companies in Europe and Asia. UK's FTSE 100 index and Dutch AEX both saw their values pulled down because firms connected with the internet, computing and mobile phone - so called tech stocks - that had dominated the stock markets had a torrid time especially in 1999-2000. Economic slowdown in Europe during this period acted as a depressant on companies' profitability, and sometimes on their solvency. The situation has been compounded by

the threats in the aftermath of September 11, 2001. There is definitely a relationship between volatility and economic slow down and threat of terrorist attacks. Against a backdrop of deep uncertainty, share prices fluctuate permanently, in line with the pessimism of market participants.

## **V. CONCLUSIONS**

This paper examined the volatility of returns in fifteen emerging and developed European financial markets. A set of parametric and non-parametric tests was used to test the equality of mean returns and standard deviations of the returns. Results suggest that there was generally high volatility of returns in the markets during the period 1997-2004 and that the results of the *Levene's* (1960) could not reject the Null Hypothesis that mean returns are equal across the days of the week for all the markets except for Italy.

Results suggest that there was generally high volatility of returns in the markets during the period 1997-2004 and that there were some surprises in terms of volatility and loss of value in the case of some developed European stock markets. Nevertheless, the emerging markets in general had higher returns and higher volatilities, particularly Russia and Turkey. Even though the markets of Russia, Turkey and Spain showed the highest standard deviations the markets that displayed the highest coefficients of variation are those of Austria, Belgium, Czech Republic, Denmark, France, Germany, Italy, Switzerland and Turkey. The generally low returns for these countries except in the case of Turkey may be partially responsible for this observation. Findings of this study can be useful for international investors who are looking for investment opportunities in Europe based on the volatility of the major Emerging and Developed European Stock Markets. Such investors should make a careful and objective appraisal of the present opportunities in the European markets in light of the findings of the present study. The volatility, while uncomfortable in the near term, provides a classic long-term buying opportunity. During volatile times, many investors get spooked and begin to question their investment strategies. This is especially true for novice investors, who can often be tempted to pull

out of the market altogether and wait on the sidelines until it seems safe to dive back in. As the present study indicates, investors should realize that market volatility is inevitable both in emerging and developed markets in Europe. It's the nature of the markets to fluctuate over the short term. Because trying to time the market over the short term is extremely difficult, investors should maintain a long-term horizon and ignore the short-term fluctuations.

## REFERENCES

- Apolinario, R. M. C.; Santana, O. M.; Sales, L. J. and Caro, A.R. (2006). Day of the Week Effect on European Stock Markets. *International Research Journal of Finance and Economics*, Issue 2, pp. 53-70.
- Chiodo, A. J. and Owyang, M.T. (2002). A Case Study of a Currency Crisis: The Russian Default of 1998. Federal Reserve of St. Louis (November-December).
- Cross, F. (1973). The behavior of stock price on Fridays and Mondays. *Financial Analyst Journal*, Vol. 29, pp. 67-69.
- Dockery, E. and Vergari, F. (2001). An investigation of the linkages between European Union equity markets and emerging capital markets: the East European connection. *Managerial Finance*, Vol. 27 (1/2), pp. 24-39.
- Dubois, M. and Louvet, P. (1996). The Day-of-the-week Effect: The International Evidence. *Journal of Banking and Finance*, Vol. 20, pp. 1463-1484.
- Eun, C. S. and Shim, S. (1989). International transmission of stock market movements. *Journal Financial and Quantitative Analysis*, Vol. 24, pp. 241-256.
- Feridun, M. (2004). Turkish Financial Crisis of February 2001: Did Politics Play Any Role? *Investment Management and Financial Innovations*, Vol. 1, No. 1 pp: 41-50.
- Feridun, M. (2005a). Impact of Monetary Policy on Economic Instability: An Empirical Analysis on Turkey (1983 - 2003). *Prague Economic Papers (Czech Republic)*, Vol.14, No.2, pp. 171-181.
- Feridun, M. (2005b). Russian financial crisis of 1998: An Econometric Investigation. *International Journal of Applied Econometrics and Quantitative Studies*, Vol. 1, No. 4, pp. 113-125.
- French, K. (1980). Stock returns and the week-end effect. *Journal of Financial Economics*, 8, 55-70.
- Gibbons, R. S. and Hess, P. (1981). Day of the Week Effects and Asset Return. *Journal of Business*, Vol. 54, pp. 579-96.
- Gerrits, R.J. and Yuce, A. (1999). Short- and long-term links among European and US stock markets. *Applied Financial Economics*, Vol. 9, pp. 1-9.
- Gilmore, C.G. and McManus, G.M. (2002). International portfolio diversification: US and Central European equity markets. *Emerging Markets Review*, Vol. 3, pp. 69-83.
- Gultekin, M. and Gultekin, N. B. (1983). Stock Market Seasonality: International Evidence. *Journal of Financial Economics*, Vol. 12, pp. 469-481.

- Hanousek, K. and Filer, R.K. (2000). The relationship between economic factors and equity markets in Central Europe. *Economics of Transition*, Vol. 8, pp. 99-126.
- Hessel, H. (2006). Foreign Direct Investment Growth Rate to Emerging Market Economies Slows In 2005, But There Is Still Plenty To Go Around. Standard and Poors Credit Ratings, Publication date: 27-Feb-06.
- Harris, L. (1986). A transaction Data Study of Weekly and Intra daily Patterns in Stock Returns. *Journal of Financial Economics*, Vol. 16, pp. 99-117.
- Jaff, J. and Westerfield, R. (1985a). The week-end effect in common stock return: the international evidence. *Journal of Finance*, Vol. 40, pp. 433-54.
- Jaff, J. and Westerfield, R. (1985b). Patterns in Japanese common stock returns: day of the week and turn of the year effect. *Journal of Financial Quantitative Analysis*, Vol. 20, pp. 261-72.
- Jaff, J.; Westerfield, R.L and Ma, C. (1989). A twist on the Monday effect in stock prices: Evidence from the U.S. and foreign stock markets". *Journal of Banking and Finance*, Vol. 13, pp. 641-50.
- Jochum, C.; Kirchgasser, G. and Platek, M. (1999). A long-run relationship between Eastern European stock markets? Cointegration and the 1997/98 crisis in emerging markets. *Weltwirtschaftliches Archi*, Vol. 135, pp. 455-79.
- Kato, K. (1990). Weekly patterns in Japanese stock returns. *Management Science*, Vol. 36, pp. 1031-43.
- Kazunari, O. and Honebon, C. (1999). Experiences of Three Eastern European Countries During The Russian Crisis - An Analysis of 'Contagioni'. *Bank of Japan Working Papers*.
- Lakonishok, J. and Levi, M. (1982). Week-end effects on stock returns: a note. *Journal of Finance*, Vol. 37, pp. 883-89.
- \_\_\_\_\_ and Smidt, S. (1988). Are seasonal anomalies real? A ninety-year perspective. *Review of Financial Studies*, Vol. 1, pp. 403-25.
- Levene, H. (1960). Robust tests for equality of variances in contribution to probability and statistics. 1<sup>st</sup> ed. Olkin: Stanford University Press, Palo Alto.
- Mehdian, S. and Perry, M. (2001). The reversal of the Monday effect: new evidence from US equity markets. *Journal of Business Finance and Accounting*, Vol. 28, pp. 1043-1066.
- MacDonald, R. (2001). Transformation of external shocks and capital market integration, in: Schroder, M. (Ed.), *The New Capital Markets in Central and Eastern Europe*. The Centre for European Economic Research, Springer Verlag, pp. 210-45.
- Ng, A. (2000). Volatility Spillover effects from Japan and the US to the Pacific-Basin. *Journal of International Money and Finance*, Vol. 19, pp. 207-233.
- Rogalski, R. (1984). New findings regarding day of the week returns over trading and non-trading period. *Journal of Finance*, Vol. 39, pp. 1603-14.
- Solnik, S. and Bounsqet, L. (1990). Day-of-the-week Effect on the Paris Bourse. *Journal of Banking and Finance*, Vol. 14, pp. 461-468.
- Steely, P.L. and Steely, J.M. (1999). Changes in the co movement of European equity markets, *Economic Inquiry*, July, pp. 473-81.
- Snedecor, G. W. and Cochran, W.G. (1976). *Statistical Methods*. Ames: Iowa State University Press.
- Syriopoulos, Th. (2004). Modeling long run dynamics in transitional European equity markets. *European Economics and Finance Review*, Vol. 3, No. 4, pp. 57-83.
- Yang, J.J.; Min, I. and Li, Q. (2003). European stock market integration: does EMU matter? *Journal of Business Finance and Accounting*, Vol. 30.

## APPENDIX

Table 1. Daily Returns: Basic Statistics for the ATX, Austria 1997-2004.

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.0299	0.0233	0.0118	-0.0157	0.00372
Median	0.0180	0.0240	0.0296	0.00304	0.0225
Maximum	1.6086	1.4734	2.2854	1.4057	1.8268
Minimum	-1.8099	-3.7781	-1.9472	-2.7908	-2.2517
Standard Dev.	0.4711	0.4625	0.4125	0.4238	0.4526
Skewness	-0.16	-1.15	-0.30	-1.08	-0.48
Kurtosis	1.14	9.40	3.86	5.60	3.00
Variance	0.2219	0.2140	0.1702	0.1796	0.2048
Coefficient of variation	1576.35	1984.26	3494.11	-2692.81	12153.64
Observations	536	556	559	535	541

Table 2. Daily Returns: Basic Statistics for the BEL 20 Index, Belgium, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.00356	-0.300	0.00113	0.327	0.0134
Median	0.0119	0.00309	0.00653	0.00652	0.0218
Maximum	2.6855	2.573	2.3400	200.078	3.0336
Minimum	-2.7348	-199.936	-2.1124	-1.944	-1.9288
Standard Dev.	0.5179	7.885	0.4290	7.954	0.4685
Skewness	-0.12	-25.28	0.01	25.06	0.36
Kurtosis	4.33	641.05	4.58	630.28	4.66
Variance	0.2683	62.172	0.1841	63.268	0.2195
Coefficient of variation	14564.94	-2625.67	37857.20	2429.42	3498.46
Observations	611	645	644	635	623

Table 3. Daily Returns: Basic Statistics for the DX 50, Czech Republic, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.00585	0.0154	-0.0229	0.0242	0.0152
Median	0.0181	-0.0120	-0.0118	0.0376	0.00801
Maximum	1.8276	2.5276	2.0693	1.6655	1.6976
Minimum	-2.5661	-1.7942	-2.3534	-3.0736	-1.6495
Standard Dev.	0.5946	0.5844	0.6238	0.6110	0.5331
Skewness	-0.46	0.39	-0.23	-0.65	0.11
Kurtosis	1.63	1.48	0.83	1.98	0.68
Variance	0.3535	0.3415	0.3892	0.3733	0.2842
Coefficient of variation	-10162.47	3801.15	-2726.06	2519.97	3518.60
Observations	311	318	319	322	317

Table 4. Daily Returns: Basic Statistics for the KFX 20 Index Denmark, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.00566	0.0185	0.0213	0.0153	0.0240
Median	0.0190	0.0275	0.0192	0.0180	0.00741
Maximum	2.1584	2.0157	1.4571	2.1301	2.0650
Minimum	-2.7180	-1.9156	-2.4287	-1.6351	-2.0220
Standard Dev.	0.5267	0.4942	0.4759	0.4811	0.4239
Skewness	-0.39	-0.10	-0.51	-0.12	0.02
Kurtosis	2.76	1.76	2.16	1.37	2.74
Variance	0.2774	0.2442	0.2265	0.2315	0.1797
Coefficient of variation	9309.68	2672.26	2235.26	3141.94	1768.33
Observations	533	552	557	537	533



Table 5. Daily Returns: Basic Statistics for the CAC 40 France, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.0120	0.0178	-0.00936	0.0278	0.0139
Median	0.0199	0.0187	0.0000	0.0152	0.0000
Maximum	2.9536	2.9214	2.6482	2.9665	3.0411
Minimum	-3.2899	-3.3345	-1.9576	-2.4438	-2.4100
Standard Dev.	0.6751	0.5977	0.5745	0.6369	0.5676
Skewness	-0.31	-0.17	-0.02	0.06	0.13
Kurtosis	2.65	3.15	1.25	2.27	2.27
Variance	0.4558	0.3572	0.3300	0.4057	0.3222
Coefficient of variation	-5639.39	3349.92	-6137.39	2288.30	4092.73
Observations	718	718	718	718	718

Table 6. Daily Returns: Basic Statistics for the DAX, Germany, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.0395	0.0253	-0.0196	0.0104	0.0125
Median	0.0638	0.0390	-0.0158	0.0121	0.0300
Maximum	3.2801	2.9713	2.3991	3.1652	3.0307
Minimum	-4.2869	-2.6087	-2.8890	-2.6056	-2.8229
Standard Dev.	0.7341	0.6045	0.6232	0.6483	0.6276
Skewness	-0.34	-0.18	-0.24	0.14	-0.24
Kurtosis	3.60	3.37	2.00	3.82	3.27
Variance	0.5390	0.3654	0.3884	0.4202	0.3938
Coefficient of variation	1857.07	2392.74	-3181.38	6239.88	5018.68
Observations	674	674	674	674	674

Table 7. Daily Returns: Basic Statistics for the MBTEL, Italy, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.0137	0.0360	-0.0286	0.0280	0.0384
Median	-0.0105	0.0279	-0.0123	0.0499	0.022
Maximum	2.9670	2.2983	2.0694	2.0363	1.9044
Minimum	-5.5318	-4.6243	-1.8109	-2.3596	-2.2161
Standard Dev.	0.7413	0.6131	0.5639	0.5889	0.5519
Skewness	-0.54	-0.81	-0.03	-0.41	-0.14
Kurtosis	6.98	7.07	0.60	1.95	0.96
Variance	0.5495	0.3758	0.3180	0.3468	0.3046
Coefficient of variation	-5412.89	1701.16	-1969.08	2104.31	1436.66
Observations	515	525	524	525	520

Table 8. Daily Returns: Basic Statistics for the AEX, Netherlands, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.0540	0.0179	-0.0194	-0.000971	0.0252
Median	0.1016	0.0181	-0.0136	0.0110	0.0447
Maximum	3.2123	3.2366	2.2078	4.1331	2.9827
Minimum	-3.1135	-2.1883	-2.8402	-2.6535	-3.2707
Standard Dev.	0.7106	0.5847	0.5724	0.6446	0.6055
Skewness	-0.51	0.18	-0.44	0.37	-0.11
Kurtosis	3.66	4.07	2.93	5.30	4.18
Variance	0.5049	0.3419	0.3276	0.4155	0.3666
Coefficient of variation	1315.25	3257.90	-2954.37	-66405.66	2398.48
Observations	554	575	573	565	558

Table 9. Daily Returns: Basic Statistics for the MTM, Russia, 1997-2004.

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.0428	0.128	-0.0903	0.0721	0.1125
Median	0.0525	0.126	-0.1067	0.1848	0.1274
Maximum	10.094	14.012	8.8781	4.7806	4.0105
Minimum	-15.412	-11.552	-7.9997	-6.9261	-6.3930
Standard Dev.	1.940	1.956	1.6474	1.4394	1.2608
Skewness	-1.15	0.00	0.71	-.75	-0.33
Kurtosis	16.43	17.03	7.04	2.90	3.27
Variance	3.762	3.828	2.7139	2.0718	1.5896
Coefficient of variation	4532.53	1526.82	-1823.74	1997.51	1120.30
Observations	295	313	311	317	305

Table 10. Daily Returns: Basic Statistics for the SAX, Slovakia, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.1101	0.0371	0.0480	0.0313	0.00347
Median	-0.0375	0.0101	0.0300	0.0000	0.0192
Maximum	2.3713	2.5309	4.1578	3.0896	2.2541
Minimum	-4.9874	-2.0232	-2.4780	-3.0205	-3.8290
Standard Dev.	0.7741	0.5756	0.7478	0.74797	0.6462
Skewness	1.19	0.16	0.69	-0.06	-1.04
Kurtosis	7.36	2.35	4.20	4.95	6.72
Variance	0.5993	0.3313	0.3313	0.4222	0.4176
Coefficient of variation	-703.38	1550.18	1559.45	2074.44	18606.52
Observations	294	297	294	283	285

Table 11. Daily Returns: Basic Statistics for the SMSI, Spain, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.0303	-0.717	-0.0532	0.784	0.0220
Median	0.0173	0.0474	-0.00609	0.0895	0.0264
Maximum	2.1796	2.821	1.7137	200.722	2.0729
Minimum	-1.7909	-200.625	-1.5552	-1.682	-1.8843
Standard Dev.	0.6115	12.135	0.5440	12.093	0.5619
Skewness	-0.09	-16.50	0.11	16.56	0.02
Kurtosis	0.99	272.73	0.70	274.71	1.04
Variance	0.3739	147.262	0.2959	146.231	0.3157
Coefficient of variation	-2015.13	-1693.38	-1023.43	1542.15	2555.32
Observations	267	274	273	276	266

Table 12. Daily Returns: Basic Statistics for the SXAXPI, Sweden, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.0551	0.0138	-0.0564	0.0177	0.0407
Median	0.0782	-0.00310	-0.0655	0.0413	0.0654
Maximum	4.2894	2.6889	2.8079	2.6945	2.4786
Minimum	-2.6630	-1.9688	-2.0431	-2.994	-1.9356
Standard Dev.	0.7099	0.5863	0.6563	0.6866	0.5960
Skewness	0.26	0.21	0.18	0.05	-0.15
Kurtosis	4.77	1.49	1.41	1.92	0.95
Variance	0.5039	0.3438	0.4308	0.4714	0.3552
Coefficient of variation	1287.91	4255.93	-1164.26	3874.84	1463.72
Observations	393	404	402	396	391

Table 13. Daily Returns: Basic Statistics for the XU 100, Turkey, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.173	-0.0329	0.0122	0.2069	0.2396
Median	-0.2115	-0.1386	-0.0672	0.1748	0.1932
Maximum	5.1486	7.7190	7.4235	5.1221	6.7934
Minimum	-6.8629	-4.1010	-8.6766	-6.1084	-5.2257
Standard Dev.	1.6655	1.4435	1.5652	1.5373	1.3447
Skewness	0.03	0.99	-0.46	-0.41	0.36
Kurtosis	1.91	4.25	5.55	1.97	4.00
Variance	2.7739	2.0836	2.4497	2.3632	1.8083
Coefficient of variation	-961.22	-4385.04	12868.61	743.10	561.24
Observations	282	284	283	286	281

Table 14. Daily Returns: Basic Statistics for the SSMI Switzerland, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	0.00703	0.0132	0.0121	0.0245	0.0357
Median	0.0381	0.0301	0.0228	0.0271	0.0579
Maximum	2.8174	3.2409	1.6559	2.7260	2.4712
Minimum	-3.6405	-2.1325	-2.1046	-2.5104	-2.5028
Standard Dev.	0.5944	0.5010	0.4801	0.5406	0.4895
Skewness	-0.55	0.20	0.20	-0.1	-0.06
Kurtosis	4.38	5.29	1.86	4.39	5.20
Variance	0.3533	0.2510	0.2305	0.2923	0.2396
Coefficient of variation	8458.32	3794.38	3973.47	2205.22	1371.85
Observations	633	658	662	644	637

Table 15. Daily Returns: Basic Statistics for the FTSE 100 UK, 1997-2004

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	-0.0181	0.0200	0.00946	0.0141	0.0313
Median	0.0313	0.0378	0.0157	0.00902	0.0567
Maximum	1.9670	2.1412	3.2993	2.5640	2.3624
Minimum	-2.7745	-5.6582	-2.1359	-2.5442	-2.4208
Standard Dev.	0.4983	0.4735	0.4334	0.4565	0.4518
Skewness	-0.55	-1.82	0.17	-0.08	-0.20
Kurtosis	3.92	22.03	4.80	4.01	2.97
Variance	0.2483	0.2242	0.1878	0.2084	0.2042
Coefficient of variation	-2751.51	2369.78	4578.74	3246.13	1445.26
Observations	897	977	980	980	961