The Impact Of Non Linearities, Thin Trading And Regulatory Changes In The Efficiency Of An Emerging Capital Market

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Abstract

In this paper we provide additional empirical evidence on the importance of the right regulatory changes in the efficiency of emerging capital markets. We focus on the Greek capital market and its Athens Stock Exchange for the period between 1989 to 1999. In recent years, regulatory policies in Greece have sought to strengthen the safety, credibility and transparency of the capital market, and the Hellenic Capital Market Commission has focused on the protection of the stock exchange from systemic risks, enacted codes of conduct for investment services companies, institutional investors and underwriters, and applied measures for the protection of investors.

Using data from the Athens Stock Exchange for the last decade, we present evidence that the inefficiency observed up to 1993 was manifested through non-linear behavior. Probably, this was the result of the characteristics of the market at this time, as it has been shown to be outside the risk-return relationship. However, in recent years many changes have characterized the institutional and regulatory framework and there is strong empirical evidence that after 1993 the market became more efficient. Our results are in accordance with the findings of other related studies concerning emerging capital markets.

changes in an emerging capital market improve investor's participation, increase volume of trading and improve the reliability and timeliness of information. We also show that the test of the efficient market hypothesis by the linear model is not adequate because it masks the existence of non linear relations in the market.

The rest of the paper is organized as follows. In section 2 we describe the recent development of the Greek stock market and briefly present the recent regulatory changes. Section 3 presents the data and the methodology followed and section 4 gives the empirical results along with discussion. The paper concludes with section 5.

The development of the Athens Stock Exchange and the regulation of the Greek capital market

The Athens Stock Exchange (ASE) was established in 1876 as a self regulated public institution, and Law 1308/1918 set up the ASE as a public entity. In recent years, Law 1806/1988 introduced new concepts in stock exchange operation and regulation, Law 2324/1995 transformed the ASE into a joint stock company, and Law 2533/1997 provided the legal framework for the privatization of the ASE. Major changes in the regulatory structure have taken place on a frequent basis since that date (Hellenic Capital Market Commission "Annual Report", 1997, 1998, 1999 and Athens Stock Exchange "Fact Book", 2000).

Ministerial Decision 6280/B508/1989 defined the Books and Records to be kept by the ASE members and their relevant obligations. Law 1969/1991 established the Capital Market Commission as a supervisory authority, and Law 2166/1993 reinforced the role of the Commission. Presidential Decree 50/1992 specified the type of information that should be included in a company's prospectus, and Presidential Decree 52/1992 defined the way prospectuses should be published. Presidential Decree 51, embodying the European Directive 88/627/EC into Greek Law, stipulated the disclosure obligations of shareholders of listed companies in case of transfer participations.

Law 2396/1996 implemented into Greek law the EU Directives on the "Provision of Investment Service", and on the Capital Adequacy of companies providing investment services. Law 2533/1997 created three new markets, i.e. the derivatives market, the parallel market for emerging markets and the market for fixed income securities. Law 2651/1998 amended the listing requirements for the Main Market and Ministerial Decision 2063/B69/1999 defined the basic listing requirements for the Parallel Market. Finally, Law 2733/1999 provided the regulatory framework for the New Market, where small and medium-sized companies that are fast growing or innovative can be admitted to listing. The same year the Capital Market Commission published the Code for Corporate Governance for the Greek companies listed on the ASE.

During the last decade, the General Index of the ASE (GIASE) has followed an upward trend. The total return over this period is 28.3%, whilst in the last year it was 102.2% which was one of the highest worldwide. The total value of transactions also followed this trend. Indeed, the total value of transactions in 1999 exceeded 59 trillion GRD (174 billion Euros) representing an increase of 218% in relation to 1998.

The total market capitalization of the ASE listed companies amounted to 67.3 trillion GRD (197.9 billion Euros) at the end of 1999, representing an increase of 195% in relation to 1998 and an eleven-fold increase in relation to 1996. Table 1 gives a summary picture of the development of the ASE.

Table 1. Yearly Statistics for the ASE: 1990-1999.

Year	GIASE	Value of Transactions (billion GRD)	Market Capitalization (billion GRD)	Market Capitalization % GDP
1990	932.00	608.7	-	18.5
1991	809.71	437.6	2,355.2	14.5
1992	672.31	307.3	2,044.3	10.9
1993	958.66	637.1	3,117.0	14.7
1994	868.91	1,262.1	3,577.8	14.9
1995	914.15	1,498.5	4,026.0	14.9
1996	933.48	1,990.1	5,944.8	20.0
1997	1,479.63	5,802.1	9,811.3	31.7
1998	2,737.55	18,497.4	22,838.7	64.3
1999	5,535.09	58,954.5	67,306.5	169.4

Table 1a. $R_t = \alpha_0 + \alpha_1 R_{t-1} + e_t$

Included obs.: 3268

	Coefficient	Std. Error	T-Statistic	Probability
α_0	0.000966 *	0.000344	2.811367	0.0050
A_1	0.230320 *	0.017028	13.52618	0.0000
Breusch-Godfrey Serial Correlation LM Test			F-statistic	5.396433 **
			Prob	0.001056
Durbin-Watson stat			1.978574	

* denotes statistically significant at the 5% level

Table 1b $R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{t-1}^2 + e_t$

Included obs.: 3268

	Coefficient	Std. Error	T-Statistic	Probability
α_0	0.001113 *	0.000354	3.141149	0.0017
A_1	0.233464 *	0.017124	13.63338	0.0000
A_2	-0.371195	0.219850	-1.688402	0.0914
Breusch-Godfrey Serial Correlation LM Test			F-statistic	8.401792
			Prob	0.003774
Durbin-Watson stat			1.976434	

* denotes statistically significant at the 5% level

Table 1c $R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{t-1}^2 + \alpha_3 R_{t-1}^3 + e_t$

Included obs.: 3268

	Coefficient	Std. Error	T-Statistic	Probability
α_0	0.000924 *	0.000341	2.710360	0.0068
A_1	0.296325 *	0.019016	15.58273	0.0000
A_2	-10.21146 *	1.353615	-7.543843	0.0000
Breusch-Godfrey Serial Correlation LM Test			F-statistic	1.359654
			Prob	0.243683
Durbin-Watson stat			1.976434	

* denotes statistically significant at the 5% level

From Table 1 we observe the spectacular increase of the GIASE and the value of transactions on the ASE during recent years. The enduring process of maturation of the Greek capital market is also reflected in the growth of total market capitalization to other macroeconomic variables. Indeed, by the end of 1999 total ASE capitalization of listed companies corresponded to 169.4% of the country's

estimated GDP, over 64.3% in 1998 and 31.7% in 1997, which is among the highest in the OECD countries. In addition, total ASE capitalization of listed companies in 1999 corresponded to 187.8% of the broad index of liquidity of the Greek economy (over 93.1% of the previous year) and 294.7% of the value of total private deposits and repos in the commercial banks (over 122.1% of the previous year). Thus, the Greek capital market has been transformed in the last few years into a high liquidity market, mainly as a result of the remarkable shift in the economy's saving behavior into higher risk/higher return investments. This development of the ASE reflects the rapid overcoming of traditional structural weaknesses of the Greek economy and the increasing role of the capital market as a mechanism for the attraction of national savings, the finance of corporate investment and the augmenting of economic growth. The growth and depth of the capital market in recent years is also connected with the introduction of innovations in infrastructures, processes and products, as well as with the effectiveness and credibility of supervision.

Data and methodology

This paper investigates the efficiency of the Athens Stock Exchange (ASE) taking into account the possibility of non linearities in the price time series, and thin trading characteristics of the Greek stock market. We use data on the ASE General Index for the period 1989 to 1999. We use the General Index because it represents more than 40% of the value of trade on the ASE, and it represents more than 50% of the total market capitalization. ASE General Index is composed by 60 companies which represent approximately 18% of the total listed companies in the ASE.

We use an augmented logistic equation model (Antoniou *et al.* 1997) as a basis for investigation to take into account the non linearity in the data. The logistic equation has also the advantage that it is capable of capturing feedback mechanisms:

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_n R_{t-n}^n + \varepsilon_t \quad (1)$$

where R is the return calculated as the difference of log prices, and $n=2, 3$. For the efficient markets hypothesis to hold we would expect all the regression's coefficients to be equal to zero and ε be a white noise process.

According to Merton *et al.* (1994), infrequent trading has two forms. The first occurs when stocks trade every consecutive interval, but not necessarily at the close of each interval. This form is known as non-synchronous trading. Infrequent trading is also said to occur when stocks do not trade every consecutive interval. It is often referred to as "non-trading". As the trading interval shrinks, non-synchronous trading becomes non-trading.

Infrequently traded securities can affect the results of empirical studies on efficiency by introducing serious bias into the results of the empirical work. The major source of bias is that prices recorded at the end of a time period have a tendency to represent an outcome of a transaction which occurred earlier in, or prior to, the period in question. Thus, thin trading introduces autocorrelation in the time series of returns for a series which would otherwise exhibit serial independence.

To incorporate thin trading into the analysis, Miller *et al.* (1994) suggest that to remove the impact of thin trading a moving average (MA) model that reflects the number of non-trading days should be estimated and then returns be adjusted accordingly. However, given the difficulties in identifying the

non-trading days, Miller *et al.* have shown that it is equally valuable to estimate an AR(1) model from which the non-trading adjustment can be obtained. This model involves estimating the residuals of the AR(1) equation, and then adjust the returns as follows:

$$R_t = \alpha_1 + \alpha_2 R_{t-1} + e_t \quad (2)$$

$$R_t^{adj} = \frac{e_t}{(1 - \alpha_2)} \quad (3)$$

Empirical results

Tables 1a, 1b, and 1c present the results of the random walk test using the unadjusted equation of returns, for the period 1989 to 1999.

Table 1a presents results excluding the non-linear term. Coefficient α_1 in this Table is statistically significant at the 5% level of significance, which implies predictability in returns, and thus inefficiency, since the random walk is rejected. Furthermore, the diagnostic tests show that the hypothesis that the error term is a white noise process is rejected, since the series is found to be serially correlated.

As has already been suggested by many studies, this serial correlation may be due to the presence of non-linearities that are omitted. For that reason we will include in the above equation the non-linear terms R_{t-1}^2 and in a second equation we will include R_{t-1}^3 in order to test if the inclusion of the non-linear term alters the results and to check the nature of the non-linear term.

Table 1b shows that the inclusion of the R_{t-1}^2 term does not cause any change in the conclusion drawn since it is insignificant. R_{t-1} is still significant and serial correlation is not removed. Thus, we cannot say that the inclusion of the term leads to the error term having white noise properties.

However, we observe a dramatic change when we include the R_{t-1}^3 term. As shown by the results presented in Table 1c, this term is statistically significant. In addition the error term has white noise properties since the serial correlation is removed.

Tables 2a, 2b and 2c follow the same procedure but with the Returns being adjusted for thin trading. Table 2a implies that the adjustment of return for thin trading appears to have removed the predictability. This result is in conflict with the result obtained in Table 1a. As a consequence we cannot reject the efficient market hypothesis.

Tables 2b and 2c, however, lead to a completely different conclusion since in both cases the non-linear term appears to be statistically significant at the 5% level and serial correlation in the residuals is present again. Furthermore, in the case of table 2c α_1 is significant as well. This implies that predictability of the returns is possible to a certain degree and efficiency is rejected. The different conclusions that are drawn when we include the non-linear components mean that the results of the equation where these components are omitted are questionable. This is because if the market is by nature non-linear, it may look like random walk, but the use of a linear model leads to wrong inferences.

Table 3 repeats the previous methodology on a yearly basis, in order to check whether there has

been an effect on the market from the huge expansion of the ASE and the continuously changing regulatory framework. The equation estimated does not include non linear terms.

Table 2a $R_t^{adj} = \alpha_0 + \alpha_1 R_{t-1}^{adj} + e_t$

Included obs.: 3267

	Coefficient	Std. Error	T-Statistic	Probability
α_0	0.00000297	0.000446	0.006673	0.9947
A_1	0.296325 *	0.017500	0.610182	0.5418
Breusch-Godfrey Serial Correlation LM Test			F-statistic	2.415484
			Prob	0.089484
Durbin-Watson stat.			1.999188	

* denotes statistically significant at the 5% level

Table 2b $R_t^{adj} = \alpha_0 + \alpha_1 R_{t-1}^{adj} + \alpha_2 R_{t-1}^{adj^2} + e_t$

Included obs.: 3268

	Coefficient	Std. Error	T-Statistic	Probability
A_0	0.000288	0.000461	0.623476	0.5330
A_1	0.014094	0.017546	0.803265	0.4219
A_2	-0.438550 *	0.184002	-2.383397	0.0172
Breusch-Godfrey Serial Correlation LM Test			F-statistic	Prob.
			3.041075	0.027840
Durbin-Watson stat			1.996552	

* denotes statistically significant at the 5% level

Table 2c $R_t^{adj} = \alpha_0 + \alpha_1 R_{t-1}^{adj} + \alpha_3 R_{t-1}^{adj^3} + e_t$

Included obs.: 3268

	Coefficient	Std. Error	T-Statistic	Probability
α_0	0.0000384	0.000442	0.086910	0.9307
A_1	0.078773 *	0.019796	3.979340	0.0001
A_3	-6.990114 *	0.975343	-7.166828	0.0000
Breusch-Godfrey Serial Correlation LM Test			F-statistic	6.029688 *
			Prob	0.002433
Durbin-Watson stat			1.996552	

* denotes statistically significant at the 5% level

The results show that the α_0 coefficient does not appear to be significant at any time during the decade and α_1 appears significant in a few cases only (1989, 1993, and 1999), showing that efficiency cannot be rejected. Serial correlation in the residuals appears in two cases, leading to the conclusion that the error term generally follows a white noise process. It is easy to notice, however, that the existence of predictability is more common in the early years. From 1994 until 1998, when the market volume grew considerably, α_1 is insignificant. Only in the year 1999 is α_1 significant. This is because investors were no doubt acting irrationally, investing in accordance with mass psychology.

The introduction of non-linear terms gives an interesting figure and it is shown in tables 4a and 4b. From table 4a we observe that the coefficient α_1 is statistically significant for 1989, 1990 and 1993 with the non-linear term being statistically significant for 1989 and 1993. Approximately, the same pattern is observed in table 4b. However, for 1993 onwards we observe no predictability. The result is that after 1993 the market became more efficient. Pre 1993 poor quality of information, institutional restrictions and possibly less informed investors, appear to have resulted in non linear behavior and inefficiency. This result also confirms the findings of Antoniou *et al.* (1997) for another emerging capital market.

Table 3. Estimation on a yearly basis of the equation $R_t^{adj} = \alpha_0 + \alpha_1 R_{t-1}^{adj} + e_t$

Year	A0	A1	LM test for Autocorrelation
1989	0,00107 (0,6318)	-0,14420 * (-2,2250)	(1,0784)
1990	0,00167 (0,7010)	0,05130 (0,7841)	(4,1519) *
1991	-0,00205 (-1,4484)	-0,12171 (-1,9192)	(0,1736)
1992	-0,00190 (-1,5855)	0,04605 (0,7289)	(1,5924)
1993	0,00019 (0,1369)	-0,23298 * (-3,7826)	(0,1015)
1994	-0,00163 (-1,4184)	0,01718 (0,2710)	(2,0205)
1995	-0,00096 (-1,2270)	0,10080 (1,5947)	(0,6515)
1996	-0,00116 (-1,6697)	0,01194 (0,1879)	(6,1858) *
1997	0,00056 (0,3694)	0,07307 (1,1491)	(2,3585)
1998	0,00126 (0,6449)	-0,05087 (-0,8037)	(0,5141)
1999	0,00177 (0,8924)	-0,14698* (-2,2682)	(0,9274)

In parentheses are the t-statistics, * denotes statistically significant at the 5% level, and ** denotes the existence of serial correlation in the residuals

The inferences drawn above assume that the observed predictability is true return predictability and not evidence of changes in time-variation of risk premia (see, for example, Fama and French 1989, 1992). We next examine whether the pattern of predictability is evident when a measure of time-varying risk is included in the analysis. Merton (1980) shows that the risk premium of the market is a function of volatility in the markets, as in the following equation:

$$E_{t-1}[R_{mt}] = \lambda_{t-1} \text{var}_{t-1}[R_{mt}] \quad (4)$$

where R_{mt} is the return on the market portfolio, var_{t-1} is the variance, λ_{t-1} is the market price of risk and E is the expectations. This model can be estimated using a GARCH-M model (see Engle, Lilien and Robbins, 1987; application by Antoniou *et al* 1994) which allows for time variation in the conditional variance. Thus, we estimate the following GARCH-M model:

$$\begin{aligned} R_t^{adj} &= \alpha_0 + \lambda h_t + \alpha_1 R_{t-1}^{adj} + \alpha_n R_{t-1}^{n(adj)} + \varepsilon_t \\ h_t &= b_0 + b_1 \varepsilon_{t-1}^2 + b_2 h_{t-1} \end{aligned} \quad (5)$$

where h_t is the conditional variance and ε_t is an error term. Table 5 presents the results.

Table 4a. Estimation of the equation: $R_t^{adj} = C + a_1 R_{t-1}^{adj} + a_2 R_{t-1}^{(adj)^2} + e_t$

Year	C	R_{t-1}^{adj}	$R_{t-1}^{(adj)^2}$	LM test for Autocorrelation
1989	-0.0004 (-0.309)	-0.1300 * (-2.100)	2.1430 * (3.100)	9.142 **
1990	0.0022 (0.969)	0.0336 (0.558)	-0.8959 (-1.262)	1.487
1991	-0.0024 (-1.607)	-0.1252 * (-1.966)	0.7701 (0.715)	0.174
1992	-0.0019 (-1.406)	0.0460 (0.727)	-0.0666 (-0.041)	2.721
1993	0.0011 (0.728)	-0.2513 * (-4.013)	-1.8332* (-1.956)	0.130
1994	-0.0021 (-1.618)	0.0164 (0.258)	1.3922 (0.784)	4.894**
1995	-0.0008 (-0.929)	0.1066 (1.622)	-0.8551 (-0.329)	0.632
1996	-0.0019 * (-2.426)	0.0099 (0.158)	6.1277 (1.019)	7.280**
1997	0.0004 (0.238)	0.0744 (1.162)	0.2768 (0.215)	3.540**
1998	-0.0001 (-0.062)	-0.0509 (-0.805)	1.4685 (1.219)	1.748
1999	0.0004 (0.191)	-0.1627 * (-2.464)	1.4569 (1.214)	1.014

In parentheses are the t-statistics, * denotes statistically significant at the 5% level, and ** denotes the existence of serial correlation in the residuals

The results confirm that each year of the last decade was characterized by predictability when a non linear term is included and show that this predictability is outside the risk-return relationship. Thus, the predictability identified from Table 4b is due to inefficient pricing. In addition, the results confirm the results obtained from the period after 1993, implying that there was more efficient pricing during this period. These results also confirm the findings of Antoniou *et al.* (1997) for the case of the Istanbul Stock Exchange. Thus, there is additional evidence that equity markets in general, and the emerging capital markets in particular, become more efficient when the right institutional and regulatory framework is in place. However, for the confirmation of this hypothesis, more empirical evidence is needed with applications in other emerging capital markets.

Conclusions

In this paper we provide additional empirical evidence on the importance of the right regulatory changes in the efficiency of emerging capital markets. We focus on the Greek capital market and its Athens Stock Exchange for the period between 1989 to 1999. In recent years, regulatory policies in Greece have sought to strengthen the safety, credibility and transparency of the capital market, and the

Table 4b. Estimation of the equation: $R_t^{adj} = C + a_1 R_{t-1}^{adj} + a_2 R_{t-1}^{(adj)3} + e_t$

Year	C	R_{t-1}^{adj}	$R_{t-1}^{(adj)3}$	LM test for Autocorrelation
1989	0.0005 (0.378)	0.2612 * (3.155)	-44.8782 * (-6.492)	5.821**
1990	0.0012 (0.541)	0.0761 (0.953)	-6.2148 (-0.993)	1.710
1991	-0.0015 (-1.109)	0.1220 (1.429)	-60.9757 * (-4.112)	1.114
1992	-0.0018 (-1.504)	0.1082 (1.237)	-33.1735 (-1.027)	4.221**
1993	0.0000 (0.019)	-0.1340 (-1.654)	-31.5952 (-1.869)	0.246
1994	-0.0016 (-1.368)	0.0518 (0.526)	-21.6030 (-0.460)	7.540**
1995	-0.0007 (-0.948)	0.1999 (1.213)	-124.2993 (-1.531)	2.175
1996	-0.0010 (1.515)	0.1186 (1.360)	-193.1733 (-1.579)	8.434**
1997	0.0005 (0.326)	0.1203 (1.337)	-15.5405 (-0.743)	3.690**
1998	0.0013 (0.664)	-0.0951 (-0.956)	11.9309 (0.577)	0.692
1999	0.0020 (1.010)	0.0157 (0.153)	-41.3109 (-1.019)	0.037

In parentheses are the t-statistics, * denotes statistically significant at the 5% level, and ** denotes the existence of serial correlation in the residuals

Hellenic Capital Market Commission has focused on the protection of the stock exchange from systemic risks, enacted codes of conduct for investment services companies, institutional investors and underwriters, and applied measures for the protection of investors.

Using data from the Athens Stock Exchange for the last decade, we present evidence that the inefficiency observed up to 1993 was manifested through non-linear behavior. Probably, this was the result of the characteristics of the market at this time, as it has been shown to be outside the risk-return relationship. However, in recent years many changes have characterized the institutional and regulatory framework and there is strong empirical evidence that after 1993 the market became more efficient. Our results are in accordance with the findings of other related studies concerning emerging capital markets.

Table 5.

Year	C	R_{t-1}^{adj}	$R_{t-1}^{2,adj}$	GARCH
1989	-0,000725 (-1,431)	0,170473* (4,437)	0,396533 (0,424)	-0,401215 (-0,216)
1990	0,007196 (1,507)	0,114747** (1,852)	-0,562487 (-0,404)	-2,250496 (-0,486)
1991	-0,00509* (-3,082)	-0,032848 (-0,452)	-2,445359 (-0,575)	5,86626 (0,940)
1992	-0,001484 (-0,921)	0,055812 (0,679)	7,4251 (1,160)	-11,7473 (-1,564)
1993	0,00662* (1,971)	-0,09548* (-1,981)	5,911005 (1,202)	-20,1219** (-1,628)
1994	-0,002349 (-1,668)	-0,023453 (-0,330)	2,502225 (0,565)	-0,368039 (-0,046)
1995	-0,000746 (-0,371)	0,101111 (1,436)	3,735990 (0,673)	-6,435647 (-0,326)
1996	0,001304 (0,299)	0,062464 (0,815)	8,960122 (1,095)	-31,56128 (-0,714)
1997	0,001899 (0,573)	0,037446 (0,533)	2,143465 (0,567)	-4,008750 (-0,475)
1998	-0,14384** (-1,816)	0,029068 (0,418)	-9,4726 ** (-1,850)	5,2074** (1,844)
1999	-0,002614 (-0,580)	-0,091619 (-1,086)	-1,018670 (-0,414)	7,511409 (1,109)

In parentheses are the t-statistics, * denotes significance at the 5 % level, and ** denotes significance at the 10 % level.

Suggestions for future research

In this paper we present additional empirical evidence concerning the impact of regulatory changes, thin trading and the existence of non-linearities in an emerging capital market. However, a more complete study should include a larger sample of emerging stock exchanges. Another important parameter that might influence stock prices and efficiency in an emerging capital market is the behavior of local and foreign institutional investors, especially in the context of globalization of the markets. The influence of the behavior of institutional investors is left for later research. Finally, it is worth mentioning that other related research includes the study of integration of emerging markets in the context of non-linear transmission of market crises (Alexakis, Siriopoulos 1999).

References

1. Alexakis, P., and C.Siriopoulos, "The international stock market crisis of 1997 and the dynamic relationships between Asian stock markets: Linear and nonlinear Granger causality tests", *Managerial Finance*, 25(8), 1999, pp. 22-39.
2. Antoniou, A., Nuray Ergul, and Phil Holmes, "Market efficiency, thin trading and non-linear behaviour: Evidence from an emerging market", *European Financial Management*, 3(2), 1997, pp. 175-190.

3. Benartzi, S., and R.H.Thaler, "Myopic loss aversion and the equity premium puzzle", *National Bureau of Economic Research Working Paper*, 4369, 1992.
4. Engle, R., D.Lilien, and R.Robins, "Estimating time-varying risk premia in the term structure: The ARCH model", *Econometrica*, 55, 1987, pp. 391-407.
5. Fama, E.F., "Efficient capital markets: II", *Journal of Finance*, 46, 1991, pp. 1575-1617.
6. Fama, E.F., and K.R.French, "Business conditions and expected returns", *Journal of Financial Economics*, 23, 1989, pp. 23-49.
7. Fama, E.F., and K.R.French, "The cross sectional of expected returns", *Journal of Finance*, 47, 1992, pp. 427-465.
8. Heiner, R.A., "The origin of predictable behavior", *American Economic Review*, September 1983, pp. 560-595.
9. Kaen, F.R., and R.E.Rosenman, "Predictable behavior in financial markets", *American Economic Review*, March 1986, pp. 212-220.
10. Merton, R.C., "On estimating the expected return on the market", *Journal of Financial Economics*, 8, 1980, pp. 323-361.
11. Miller, M.H., J.Mustaswamy, and R.E.Whaley, "Mean reversion of Standard & Poor 500 index basis changes. Arbitrage-induced or statistical illusion?", *Journal of Finance*, 49, 1994, pp. 479-513.
12. Peters, E., "*Chaos and order in capital markets*", (New York: J.Wiley, 1991).
13. Schatzberg, J.D., and P.P.Reiber, "Extreme negative information and the market adjustment process: The case of corporate bankruptcy", *Quarterly Journal of Business and Economics*, 31, 1992, pp. 3-21.
14. World Bank Policy Research, "Stock markets and economic growth", *Bulletin*, 6(2), 1995, pp. 2-7.

Notes