CHAPTER 5

5. Conclusion

A basic observation about asset return data is that large returns (of either sing) tend to be followed by more large returns (of either sing). In other words the volatility of asset returns appears to be serially correlated. To capture the serial correlation of volatility, Engle (1982) proposed the class of Autoregressive Conditionally Heteroskedastic, or ARCH, models.

The paper presented the most important theoretical regularities that govern the dynamic structure of financial time series and tests their validity in Athens Stock Exchange. The Greek Stock Market is examined by applying an ARCH model on the log-returns, y_t, of the General Index of Athens Stock Exchange from 31 July 1987 to 30 July 1999. We use the model developed by Nelson (1991), assuming an Autoregressive Moving Average representation for $\ln(h_t)$. The ARCH process is named Exponential E-GARCH(2,2) in Mean and has the following form:

$$y_t = \mu_0 + \mu_1 h_t + \left(\mu_2 + \mu_3 e^{-h_t/\mu_4} \right) y_{t-1} + u_t$$

$$\ln(h_t) = a_0 + \ln(1 + N_t \delta_0) + \frac{(\Psi_1 L + \Psi_2 L^2)}{(1 - \Delta_1 L - \Delta_2 L^2)} \left(\theta \frac{u_t}{\sqrt{h_t}} + \left| \frac{u_t}{\sqrt{h_t}} \right| - E\left| \frac{u_t}{\sqrt{h_t}} \right| \right)$$

$$u_t \equiv \sqrt{h_t} z_t$$

$z_t \sim$ i.i.d.draws from the Generalized Error Distribution (GED),

with $E(z_t) = 0$, $V(z_t) = 1$.

We assume that the z_t are i.i.d. draws from the Generalized Error Distribution (GED) in order to allow for the possibility of non-normality in the conditional distribution of returns. The density of a GED random variable is given by

$$f(z_t) = \frac{v e^{-2^{-1} \left| \frac{z_t}{\lambda} \right|^v}}{\lambda 2^{v+1/v} \Gamma\left(1/v\right)},$$

$-\infty < z < \infty$, $0 < v \leq \infty$, where $\Gamma(.)$ denotes the gamma function, and

$$\lambda \equiv \left(\frac{2^{-2v^{-1}} \Gamma\left(1/v\right)}{\Gamma\left(3/v\right)} \right)^{1/2}.$$

The model fits well to Greek Stock Market data and provides empirical evidence on theoretical regularities. The main conclusions are:

i) The existence of a positive (non-linear) trade-off between stock returns and volatility.

ii) The absence of leverage effects.

iii) The thick tailed stock returns distribution.

iv) The information accumulation in a slower rate when the market is closed than when it is open.

v) The existence of positive non-synchronous trading effects.

vi) The existence of a long-term memory pattern in stock returns.

It would be interesting to develop applications of the model in the fields of portfolio risk management and financial derivatives pricing. Moreover we should test the efficiency gained, if any, in modeling with distributions other than normal. These questions are the scope of further research.