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## September 11 and time-varying beta of United States companies

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## Notes

<sup>1</sup> A detailed discussion of these factors is provided by Rosenberg and Guy (<u>1976a</u>, <u>1976b</u>).

<sup>2</sup> Rosenberg and Ohlson (<u>1976</u>), Fabozzi and Francis (1978), and Bos and Newbold (<u>1984</u>) provide evidence that security betas are not only time-varying but can also be better described by some form of stochastic model. According to Lin et al. (<u>1992</u>) the stochastic structure of the beta has important implications for the measures of capital asset pricing and performance, efficient market hypothesis and in forecasting the stock returns.

<sup>3</sup> See Markowitz (<u>1952</u>), Sharpe (<u>1964</u>) and Lintner (<u>1965</u>) for details of the CAPM.

<sup>4</sup> According to Klemkosky and Martin (<u>1975</u>) betas will be time-varying if excess returns are characterized by conditional heteroscedasticity.

![](_page_1_Figure_6.jpeg)

form of the ARCH and the GARCH models to estimate time-varying betas for different stock markets.

<sup>11</sup> In a GARCH(p, q) model different combinations of p and q may be applied but as indicated by Bollerslev et al. (<u>1992</u>, p. 10) p = q = 1 is sufficient for most financial and economic series. Bollerslev (<u>1988</u>) provides a method of selecting the size of p and q in a GARCH model. Tests in this paper were also conducted with different combinations is p and q with p = q = 2 being the maximum lag length. Results based on log-likelihood function and likelihood ratio test indicate that the best combination is p = q = 1. These results are available on request.

 $^{12}$  All the GARCH models were estimated by means of the Berndt et al. (<u>1974</u>) algorithm.

<sup>13</sup> The significant MA term may also be due to different news observed by different investors or the same news being interpreted differently by investors. This could create a negative serial correlation, as a result of a process of price adjustment where the price bounces back and forth between centres with different information.

<sup>14</sup> Before the estimation of Equation  $\underline{7}$  the stochastic structures of all variables were investigated to check for unit root(s). All variables were found to be stationery in levels

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