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Value-at-Risk analysis in the MENA equity markets: Fat tails and conditional asymmetries in return distributions

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ABSTRACT

In this paper, we examine the forecasting performance of the Value-at-Risk (VaR) models in the MENA equity markets. We use the Asymmetric Power ARCH model to analyze four MENA emerging markets, namely Egypt, Jordan, Morocco, and Turkey. While most empirical studies focus only on holding a long position of a portfolio, in this paper, we consider a short position in each market. In the process, we find that the returns have significantly fatter tails than the normal distribution and therefore introduce the Asymmetric Power ARCH model to estimate the Value-at-Risk in each market. Then, we explore the impact of asymmetry in the conditional variance and fat-tailed distributions on measuring Value-at-Risk. We find that the VaR estimates based on the Student APARCH model are more accurate than those generated using Normal APARCH models, and therefore a proper risk assessment should not neglect both the long memory and tail behavior in these markets. Our results should be useful to investors, bankers, and fund managers, whose success depends on the ability to forecast stock price movements in these markets.

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1. Introduction

The well documented high average stock returns and their low correlations with industrial markets seem to make emerging equity markets an attractive choice for diversifying portfolios. De Santis (1993) finds that adding assets from emerging markets to a benchmark portfolio consisting of US assets creates portfolios with a considerable improved reward-to-risk performance. Harvey (1995) finds that adding equity investments in emerging markets to a portfolio of industrial equity markets significantly shifts the mean-variance efficient frontier to the left. Harvey (1995) and Claessens et al. (1995) document that emerging markets returns significantly depart from normality. This departure from normality is greatly influenced by the behavior of extreme returns. These observed extreme returns produce a fatter tail empirical distribution for emerging markets stock returns than for the industrial markets.

Fat tails for stock returns in industrial markets have been extensively studied. Madelbrot (1963) and Fama (1965) point out that the distribution of stock returns has fat tails relative to the normal distribution. Madelbrot (1963) proposes a non-normal stable distribution for stock returns, in which case the variance of the distribution does not exist. Blattberg and Gonedes (1974) and, later, Bollerslev (1987), in an ARCH context, propose the Student-*t* distribution for stock returns, which has the appeal of a finite variance with fat tails. Jansen and de Vries (1991) and Loretan and Phillips (1994) use extreme value theory to analyze stock return in the US. Their results indicate the existence of second moments and possibly third and fourth moments, but not much more than the fourth moment.

In financial markets, extreme price movements may correspond to market correction during ordinary periods, to stock market crashes or to foreign exchange crises during extraordinary periods. Recently, emerging markets have experienced several extreme market events. Examples, include the Mexican devaluation at the end of 1994, the Brady bond crisis at the end of 1995, the Asian series of devaluation during 1997 and the Russian crisis at the end of 1998, among others. The common lesson from these financial disasters is that billions of dollars can be lost because of poor supervision and management of financial risks. The Value-at-Risk was developed in response to these financial disasters. The VaR summarizes the worst loss over a target horizon with a given level of confidence, and summarizes the overall market risk faced by an institution.[1]

In the context of VaR, precise prediction of the probability of an extreme movement and understanding the influence of extreme market events is of great importance for risk managers. Since all risk measurement methodologies used to estimate the Value-at-Risk (VaR) of a portfolio assume that the market behavior is stable, extreme market events demand a special approach from risk managers. One approach that can be used to estimate the VaR focuses on modeling the tail of the distribution.

Over the last decade, the empirical finance literature has been concerned with the financial dynamics of the world major stock markets. Recently, there has been a shift in attention to the emerging markets of developing countries (Bekaert and Harvey, 1997; De Santis and Imrohoroglu, 1997). For example, Bekaert and Harvey (1997) found that stock market returns in emerging markets were high and predictable but lacked strong correlation with major markets. As emerging markets mature, they are likely to become increasingly more important. The MENA (Middle East and North Africa) region is part of these markets and offer those opportunities to investors. The importance of this region is that all MENA equity markets are open to foreign investor participation and also allow repatriation of dividends and capital. Apart from Jordan where foreign investors are restricted to certain sectors but allowed to own 99% of the tourism share capital, other markets like Egypt, Morocco, and Turkey have no restrictions on foreign investors.[2] Despite their openness, these markets remain somewhat unsophisticated and MENA's combined market capitalization remains small – both in comparison to other regions, and in proportion to its overall GDP.

The underdevelopment of the region's stock markets is the result of several factors, not least of which is the fact that MENA still attracts a small proportion of the world's foreign direct investment

[1] See Dowd (1998) and Jorion (1997) for more details on the VaR methodology.

[2] For an overview of the equity markets in some Middle Eastern countries and issues related to market efficiency and organizational structure, look at Bekaert and Harvey (1995,1997), Errunza (1994), El Erian and Kumar (1995), Al-Loughani (1995) and Al-Loughani and Moosa (1997), Claessens et al. (1995), Ghysels and Cherkaoui (2003) and Appiah-Kusi and Menyah (2003).