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Downside risk and portfolio diversification in the euro-zone equity markets with special consideration of the crisis period

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A B S T R A C T

This study examines the Value-at-Risk for ten euro-zone equity markets individually and also divided into two groups: PIIGS (Portugal, Italy, Ireland, Greece and Spain) and the Core (Austria, Finland, France, Germany and the Netherlands), employing four VaR estimation and evaluation methods considered over the full period and the pre- and post-global crisis subperiods 1 and 2. The backtesting results are also evaluated according to the Basel capital requirements. The results demonstrate that the CEVT methods meet all the statistical criteria the best for most individual equity indices over the full period, but these results over the two sub-periods for those two methods are mixed, compared to those the DPOT methods. Moreover, the two optimal group portfolios of the PIIGS and the Core as well as the grand portfolio that combines the ten indices do not show much diversification benefits. The PIIGS portfolio selects Spain's *IBEX* only, while that of the Core opts for Austria's *ATX* only in the full period and subperiod 1. However, Germany's *DAX* overwhelmingly dominates both the Core and the Grand portfolios in subperiod 2.

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1. Introduction

The recent financial turmoil in the euro-zone countries has brought into focus the importance of financial risk management in those countries. The euro-zone debt crisis has affected their stock markets which are highly correlated because of increasing integration and harmonization in this area over time. The mounting risk and uncertainty resulting from the crisis have confounded investors, portfolio managers and policy-makers in the euro-zone as well as in other countries. In such an environment, it will be valuable and useful to examine the downside risk for these equity markets and figure out ways to diversify away risks under different time periods. It will also be particularly important to estimate risks during periods of extreme events like the 2007/2008 financial crisis that affected essentially all asset markets. We will examine the equity risk for the pre- and post-global financial crisis subperiods as well as the full period under consideration. Under such crisis circumstances, significant and extreme drops in prices and returns of these assets have become highly probable, with potentially damaging consequences on portfolios of individuals and institutions. These circumstances have also made risk management strategies for highly volatile markets become more challenging, particularly when the percentages of violations of confidence targets have compounded.

The quantification of the size of potential losses and the assessment of risk levels for individual markets and their portfolios are fundamental in designing prudent risk management and portfolio strategies. Value-at-Risk (VaR) models have become an important instrument within the financial markets for quantifying and assessing downside market risks associated with asset price fluctuations. They determine the maximum expected loss an asset or a portfolio can generate over a certain holding period, with a pre-determined probability value. Therefore, a VaR model can be used to evaluate the performance of individual asset and portfolio managers by providing downside risk quantification. It can also help investors and portfolio managers determine the most effective risk management strategy for a given situation. Moreover, quantification of the extreme losses in those asset markets is important in the current market environment. Extreme Value Theory (EVT) provides a comprehensive theoretical forum through which statistical models describing extreme scenarios can be developed.

There is a cost for inaccurate estimation of the VaR in equity markets, which affects the efficiency and accuracy of risk assessments. Surprisingly, despite the increasing importance and rising correlation and risk and the need for more portfolio diversification in the euro-zone markets, there are only few studies that analyze the VaRs, the VaR-based optimal portfolio constructions and their efficient VaR frontiers for these markets. The studies that examine European portfolio diversification emphasize diversification through industries instead of countries. In our paper, we assess the significance of diversification of the equity markets for portfolio combinations of two groups of ten countries in the euro-zone as well as for all ten countries combined as a grand group. The two groups are: the PIIGS which includes Portugal, Ireland, Italy, Greece and Spain, and the Core which consists of Germany, France, Austria, Finland and the Netherlands. The risk in these countries of the two groups will be investigated for the full period and before and after the crisis for comparison purposes. It will be the subject of our future research to examine expanded portfolios of these euro-zone countries by diversifying the equity portfolios with other asset classes such as commodities.

Our current study expands the spectrum of equity diversifications in the euro-zone and deals with events that are more extreme than the regular behavior dynamics of the stock indices over different periods. Therefore, it constructs VaR-based optimal portfolios, examines their characteristics and performances for this zone, and ranks those optimal portfolios using VaR-based risk performance measures.[1]

The objective of this paper is to fill this gap in the financial risk management for the euro-zone equity markets and construct optimal portfolio strategies by using more up-to-date techniques that take into account the volatility asymmetry and clustering in the pre- and post-global financial crisis periods. This topic has not been researched adequately for the seemingly harmonious euro-zone, despite the global crisis and its implications for diversification within broad investment portfolios

[1] We have constructed the efficient VaR frontiers for the portfolios. However, the frontiers constructed don't have the proper shape to allow a tangency point. The graphs are available upon request.