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## Dynamic correlations and volatility effects in the Balkan equity markets

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### ABSTRACT

This paper investigates the presence of time-varying comovements, volatility implications and dynamic correlations in major Balkan and leading mature equity markets, in order to provide quantified responses to international asset allocation decisions. Since asset returns and correlation dynamics are critical inputs in asset pricing, portfolio management and risk hedging, emphasis is placed on the respective (constant and dynamic) equity market correlations produced by alternative multivariate GARCH forms, the Constant Conditional Correlation and the Asymmetric Dynamic Conditional Correlation models. The Balkan stock markets are seen to exhibit time-varying correlations as a peer group, although correlations with the mature markets remain relatively modest. In conjunction with sensitivity analysis on the asymmetric variance–covariance matrix, active portfolio diversification to the Balkan equity markets indicates to potentially improve investors' risk–return trade-off.

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### 1. Introduction

A carefully managed enlargement policy has been at the heart of the European Union's (EU) development over several decades, targeting economic and financial integration for Europe as a whole. The accession of Bulgaria and Romania on 1 January 2007 has completed the fifth enlargement, following the earlier accession of 10 Member States in May 2004. The new Members have introduced structural reforms to meet the institutional requirements of the EU guidelines and have managed to attract

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growing foreign direct investment flows (Bank of Austria, 2004). Future enlargement will concern a number of countries of South-Eastern Europe that are at various stages on their road towards the EU. Turkey and Croatia are candidate countries, as they have started accession negotiations on 3 October 2005.

The new Members are expected to follow a stabilization and integration path into the EU. To this end, capital mobility and efficient equity markets play a critical role in the acceleration of the Balkan economic convergence process. For international investors, a key question remains whether fund allocation to the Balkan equity markets offers robust diversification benefits relative to developed equity markets and improves investors' risk-return profile. In this line, the identification of the driving forces that shape stock returns, volatility behaviour and correlation dynamics turns to be a core issue for successful international asset allocation and efficient portfolio management. Cross-market linkages and spot-futures correlations are also particularly relevant to optimal dynamic hedging strategies and risk control.

Past empirical literature has indicated a number of factors that may be responsible for emerging-mature market interrelationships, return comovements and volatility spillovers, including, indicatively, economic policy coordination, financial innovations and market deregulation, interest rate movements or financial crises with contagion effects (e.g. Syriopoulos, 2004, 2006). Tight market linkages indicate that a domestic capital market may not be efficiently insulated from external shocks and international portfolio diversification benefits can be limited. A number of past financial studies deal with financial market linkages and shock contagion effects between mature and emerging equity markets (e.g. Aggarwal et al., 1999; Ratanapakorn and Sharma, 2002; Bessler and Yang, 2003; Chaudhuri and Wu, 2003; Wong and Vlaar, 2003; Syriopoulos, 2004). Nevertheless, the Balkan equity markets have been neglected and empirical research remains thin on this region (Samitas et al., 2007). Some past studies indicate that emerging stock market behaviour increasingly depends on mature stock market volatility swings (e.g. Phylaktis and Ravazzolo, 2002; Swanson, 2003; Yang et al., 2003; Syriopoulos, 2006, 2007). If this is the case, then the empirical issues at hand can have considerable adverse implications for efficient portfolio diversification and risk control. Given that correlations in international equity markets have increased over time (e.g. Chan et al., 1997; Capelle-Blancard and Raymond, 2002; Marcelo et al., 2008), investors are interested in assessing the level of equity market linkages and the implications related to increased volatility and correlations, in order to design well-diversified portfolio strategies. A body of past literature attempts to quantify the implications of asymmetric dynamics on return volatility and correlation processes (e.g. Engle and Ng, 1993; Koutmos and Booth, 1995; Bekaert and Wu, 2000), as asymmetric volatility spillover effects have been indicated to be present in major financial markets (e.g. Koutmos and Booth, 1995; Kroner and Ng, 1998; Yang and Doong, 2004; Mazzotta, 2008). Similarly, the dynamic correlations between international capital markets also present asymmetric characteristics. Empirical evidence supports that correlations tend to increase in equity markets during turbulent periods or downward markets (e.g. Longin and Solnik, 2001; Ang and Chen, 2002; Kearney and Poti, 2006).

The core objective of this paper is to examine time-varying linkages and comovements between major Balkan equity markets and a number of leading developed equity markets; to identify key determinants of stock market co-risk and return within and across emerging and mature stock markets; to assess dynamic market correlation implications that are decisive inputs for international asset allocation, risk dispersion and efficient hedging; and, as a result, to build meaningful dynamic portfolio strategies. For this purpose, we initially implement and constructively compare the Constant Conditional Correlation (CCC) model (Bollerslev, 1990) and the Dynamic Conditional Correlation (DCC) model (Engle, 2002). Moreover, we estimate the Asymmetric Dynamic Conditional Correlation (ADCC) model, a structure that attempts to relax excessive parameter constraints of the earlier models, postulates a parsimonious parametric specification, nesting the CCC and DCC models, and allows for asymmetric effects in the variance functions (Cappiello et al., 2006). The proposed models are multivariate generalised autoregressive conditional heteroscedasticity (GARCH) structures that have gained empirical success recently in modelling time-varying asset correlations and large covariance matrices. To gain robust empirical insights, we carefully select our sample to include new EU members (Romania, Bulgaria and Cyprus), old EU members (Greece) and potential candidates (Turkey, Croatia) against benchmark mature markets (Germany and the USA).

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