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Measuring time-varying financial market integration: An unobserved components approach

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ABSTRACT

We measure the time-varying degree of world stock market integration of five developed countries (Germany, France, UK, US, and Japan) over the period 1970:1–2011:10. Time-varying financial market integration of each country is measured through the conditional variances of the country-specific and common international risk premiums in equity excess returns. The country-specific and common risk premiums and their conditional variances are estimated from a latent factor decomposition through the use of state space methods that allow for *GARCH* errors. Our empirical results suggest that stock market integration has increased over the period 1970:1–2011:10 in all countries but Japan. And while there is a structural increase in stock market integration in four out of five countries, all countries also exhibit several shorter periods of disintegration (reversals), i.e. periods in which country-specific shocks play a more dominant role. Hence, stock market integration is measured as a dynamic process that is fluctuating in the short run while gradually increasing in the long run.

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1. Introduction

The question whether the integration of the financial markets of different countries changes over time has been at the forefront of both academic research and policy making. Knowledge of the degree of financial market integration is important for different reasons. Increased financial market integration may reduce the possibility of risk diversification by decreasing the volatility of the country-specific or idiosyncratic component of asset returns. Financial integration, by reducing the portfolio home bias of investors (i.e. the tendency of investors to overweight domestic assets in their portfolios), may increase market efficiency. Increased financial market integration may also imply that domestic shocks spill over to other countries, thereby making the entire international financial system sensitive to shocks that originate in one country. Finally, the process of globalization and increased financial market integration may be responsible for changing global current account positions.

Although the general perception exists that financial market integration has increased during the past decades the empirical literature is less clear on this.[1]

For stock markets Roll (1989) reviews different papers from the 1980s and argues that cross-country correlations of equity returns in the 1980s are only marginally higher than in the 1970s. King et al. (1994) estimate a multivariate factor model for the stock returns of sixteen OECD countries from 1970 to 1988. By decomposing these returns in common and idiosyncratic factors they find a dominant role for the country-specific factors and argue that estimates pointing toward increased integration in the late 1980s are confounding transitory increases in stock market return correlations (i.e. due to the 1987 crash which had a global impact) with permanent ones. Bekaert and Harvey (1995) estimate an international CAPM in which returns are driven be a weighted average of the price of local risk and the world price of covariance risk. The weighting parameter is allowed to switch between two regimes such that market integration is time-varying. Using data

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[1] Given the large literature on the topic the literature overview that follows is unavoidably incomplete. First, we mention only studies that explicitly tackle time-variation in integration. Second, the studies mentioned focus on asset returns. We do not discuss papers that study integration through asset indices/prices. Third, we focus on time-variation in integration occurring during the past three to four decades. For a long-run perspective on equity market integration, see e.g. Goetzmann et al. (2005).

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on emerging as well as developed markets they find that stock market integration in the 1970s, 1980s, and in the early 1990s has increased in some emerging countries and decreased in others. Ramchand and Susmel (1998) employ a bivariate switching ARCH model using weekly data from 1980 to 1990 on five OECD markets. While they find that the correlations between the US returns and the returns of the other four markets are higher when the US is in a high variance state, they do not find evidence of a structural increase in stock market integration.[2] Similar results are obtained by Ball and Torous (2000) who model bivariate return correlations of six developed markets as unobservable stochastic processes and employ a filtering technique to estimate them. Bekaert et al. (2009) analyze long-run trends in international asset return correlations which they obtain from a linear factor model applied to weekly returns from 23 developed markets over the period 1980–2005. They find no evidence for an upward trend in return correlations, except for European stock markets. Bali and Cakici (2010) investigate financial market integration using Bekaert and Harvey's (1995) international CAPM framework. They estimate the CAPM using a sample consisting of monthly data for 37 countries over the period 1973–2006. They do not find strong evidence in favor of a trend increase in cross-country stock market correlations. Longin and Solnik (1995), on the other hand, find an important increase in cross-country correlations between the stock markets of seven countries (France, Germany, Switzerland, UK, Japan, Canada, US) over the period 1960–1990. They estimate a multivariate constant conditional correlation (CCC) GARCH model and find that the assumption of constant conditional correlations is not supported by the data. Instead, a linear time trend in the correlation equation is found to be statistically significant. Ammer and Mei (1996) use a VAR to decompose stock returns into news about cash flows, interest rates, and equity premiums and measure financial integration by the cross country correlation in the news about future expected stock returns. They find stronger linkages between the stock markets of the UK and the US after the abandonment of the Bretton Woods currency arrangement. Berben and Jos Jansen (2005a) estimate a bivariate GARCH model of equity returns in which the correlation can alternate between two states according to a smooth transition model. Using weekly data from 1980 to 2000 they find that the correlations between German, UK, and US equity returns have doubled over the period 1980–2000 while remaining unchanged in Japan. Carrieri et al. (2007) employ a GARCH-in-mean model for return data and find that the evolution towards more stock market integration is apparent for eight emerging economies over the period 1977–2000 though the integration process is also characterized by temporary reversals.

For European countries Baele et al. (2004) develop a price and quantity based measure of market integration and find that both measures point towards rising equity market integration. Similarly, Hardouvelis et al. (2006) find an increase in stock market integration of countries joining the European Monetary Union using a two-factor asset pricing model with GARCH innovations. Cappiello et al. (2006) estimate an asymmetric generalized dynamic conditional correlation GARCH model and document an increase in stock market integration of countries joining the European Monetary Union.[3] The impact of monetary unification on the degree of stock market integration is not always unambiguous however. Berben and Jansen (2005b) estimate a GARCH model with smoothly time-varying correlations for stock market returns of the US versus nine European countries and argue that European stock market integration was largely independent of monetary unification.

For government bond markets Barr and Priestley (2004) estimate the degree of integration of the government bond markets of Canada, Germany, Japan, the UK, and the US in the world government bond market. Their results are obtained from estimating a version of Bekaert and Harvey's (1995) international CAPM. They reject time-variation in the degree of integration of the countries considered.

Focusing on Europe however Baele et al. (2004), Berben and Jansen (2005b), Cappiello et al. (2006) – using the methodologies described above for stock markets – document an increase in government bond market integration of countries joining the European Monetary Union. Abad et al. (2010) adopt the international CAPM framework of Bekaert and Harvey (1995) to investigate whether the introduction of the euro has affected the degree of integration of EU government bond markets over the period 1999–2008. They conclude that, compared to European countries outside the euro area, euro markets are more vulnerable to EMU risk factors but less vulnerable to world risk factors. Pozzi and Wolswijk (2012) develop a model in which a standard international CAPM is nested within an international CAPM with impediments to invest in local government bond markets. Financial integration is measured through the gradual convergence of the international CAPM with impediments to the standard international CAPM. The model is estimated with state space techniques using weekly data for government bond returns for Belgium, France, Italy, Germany, and the Netherlands over the period 1995–2009. The results suggest that financial market integration increased significantly in all countries but Italy before the financial crisis started in 2007. After 2007, the integration of the government bond markets decreased in all countries. A similar result is found by Abad et al. (2011) who again use the CAPM framework of Bekaert and Harvey (1995), now with a time-varying specification for the degree of integration. Their results suggest that integration of European government bond markets has decreased since the beginning of the financial crisis in 2007.

In this paper we present a new empirical approach to investigate the time-varying integration of the stock markets of five developed countries (Germany, France, the UK, the US, and Japan). The approach combines a number of advantages which are seldom or never simultaneously achieved by the existing methodologies. First, the estimation method employed takes into consideration all countries simultaneously as opposed to an approach based on correlations between only two countries at a time. Second, the specification used to capture the time-varying degree of integration can simultaneously capture short run transitory and long run structural changes in integration.[4] Third, the approach exploits the typical characteristics of financial market data to construct a measure of time-varying financial market integration. Fourth, the approach avoids the use of – potentially low-quality – instruments and conditioning variables to proxy country-specific and common

[2] Some authors (see Brooks and Del Negro (2002) and citations therein) study the relative impact on equity returns of country-specific factors versus industry factors. Brooks and Del Negro (2002) find no evidence of a systematic global increase of industry effects relative to country factors suggesting that there is no real increase in global financial market integration. They report the opposite conclusion for Europe however suggesting that EMU is promoting greater integration across European stock markets. Similarly, Adjaoute and Danthine (2004, and citations therein) point to evidence suggesting that industry factors have become more important than country factors in the euro area.

[3] Further studies that document an increase in stock market integration related to the start of EMU include Fratzscher (2002), Kim et al. (2005), Kearney and Poti (2006), and Christiansen (2010).

[4] In the literature some papers use a Markov switching specification for the degree of integration which is well suited to capture transitory changes while other papers use deterministic specifications like time trends which are better suited to capture structural changes.

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