European financial market dependence: An industry analysis

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ABSTRACT

This paper uses a copula model to investigate the degree and determinants of European market dependence across 10 industries in 12 Euro zone and 8 non-Euro zone stock markets during the period 1992–2011. Most of the industries in Euro countries show a dependence increase with the Euro-area after the introduction of the Euro. The effects are strongest in countries with larger market capitalization and in the Financials, Industrials, Consumer Goods, Utilities, Technology and Telecommunications industries. Overall, the export intensity, interest rate sensitivity and competitiveness of an industry and the financial development and economic openness of a country are the most important determinants of changes in equity market dependence. The period around the Lehman collapse also shows higher equity market dependence between European countries, while the lower dependence increase during the period of the recent European sovereign debt crisis suggests that country-specific factors may matter more than before.

1. Introduction and motivation

The recent sovereign debt crisis has renewed the interest in European integration and the Euro by policy makers, central bankers and researchers alike. Although concerns about the future of the common European currency never completely ceased, the crisis has caused an unprecedented challenge to the Euro and has called into question the homogeneity of European countries on which the success of the monetary union is built. Consequently, the crisis is not just a financial crisis but also a crisis of confidence in the strength of the monetary union.

Against this backdrop, this paper investigates the degree and determinants of European market dependence during the period 1992–2011, comprising the introduction of the Euro, the collapse of Lehman Brothers, and the European sovereign debt crisis. Previous studies that investigate European equity market dependence have focused on the country level.[1] However, Tsatsaronis (2001), Galati and Tsatsaronis (2003), Adjaouté and Danthine (2003), and Flavin (2004) suggest that factors at the industry level

are likely more important drivers of changes in equity market dependence, particularly after the launch of the Euro. Consequently, we investigate the industry dimension of European equity market dependence. To this end, this paper provides a comprehensive analysis of the stock market dependence across 10 industries in 12 Euro-area and 8 non-Euro-area countries.

In particular, we use a copula-based model to estimate the time-varying dependence for every industry portfolio with its corresponding Euro zone index and determine whether a particular market has experienced a dependence increase with the Euro zone market around the introduction of the common currency. We also look at European equity market dependence in recent years, particularly during the European sovereign debt crisis in 2009–2011. Subsequently, we run cross-sectional regressions to investigate which country and/or industry factors determine changes in dependence.

Copulas offer significant advantages over other econometric techniques in analyzing the comovement of financial time-series.[2] In contrast to many prior studies that have used correlation coefficients to measure financial market dependence, copula functions permit flexible modeling of the dependence between random variables by enabling the construction of multivariate densities that are consistent with the univariate marginal densities without

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[1] Existing evidence on industrial dependence or integration in the literature is limited (Cappiello et al., 2010; Bekaert et al., 2013).

[2] Section 2.2.1 provides details on the advantages of copulas.

the assumption of normality. Christoffersen et al. (2012) provide strong evidence that the assumption of multivariate normality for international equity returns is inappropriate and, consequently, specify a similar copula-based model with nonlinear dependence and asymmetries. Moreover, as detailed in Embrechts et al. (2002), copula dependence does not suffer from the shortcomings of correlation coefficients. The advantages of copulas compared to other econometric techniques are documented in several studies including Rosenberg (2003) for risk management, Hennessy and Lapan (2002) and Christoffersen et al. (2012) for portfolio allocations, and Bennett and Kennedy (2004) and Rosenberg and Schuermann (2006) for derivatives pricing.

In addition, Pukthuanthong and Roll (2009) identify a fundamental flaw of cross-country linear correlation as a widely used measure of integration since it can be low even for perfectly integrated markets.[3] Consequently, they derive a new integration measure based on the explanatory power of a multifactor model and use it empirically to investigate recent trends in global integration. Since, according to Goetzmann et al. (2005), Cappiello et al. (2006, 2010) and Eiling and Gerard (2014) there exists a positive relation between market dependence and integration,[4] we compare the integration processes of the *R*-Squared metric to the dependence processes from our copula model and document similar levels and trends when averaging across countries and industries.

Our empirical results for the impact of the introduction of the Euro show that many industries of countries with larger capitalization exhibit a dependence increase with their corresponding Euro-area markets. Specifically, most dependence dynamics of the industries in France, Germany, Italy, the Netherlands and Spain show a clear increase around the introduction of the Euro. Industries in Belgium and Finland have also become significantly more pan-Euro, despite the fact that these countries are relatively small. Furthermore, significant differences exist with regard to the impact of the Euro on industrial sectors. In particular, the Financials, Industrials, Consumer Goods, Utilities, Technology and Telecommunications industries show a significant increase in dependence in most countries. The effects are particularly strong statistically and economically for Financials, Utilities, Technology and Telecommunications, which show a remarkable dependence increase with their corresponding Euro-area indices in almost all countries. By contrast, there is no clear increase for most of the industries in countries outside the Euro area such as Denmark, Sweden, Norway, and the United Kingdom.

With regard to the more recent episode, we observe higher equity market dependence between European countries and industries around the collapse of Lehman Brothers. Moreover, we find that the European sovereign debt crisis substantially slowed the increase in equity market dependence for most industries. The latter holds particularly true for industries in high-risk countries such as Greece, suggesting that country-specific factors may matter more than before.

In order to investigate the increase in market dependence across industries and countries further, we use industry-specific and country-specific variables to assess systematically what factors determine the dependence change. In particular, we consider measures of interest rate sensitivity, internationalization/export intensity, asset intangibility, competitiveness, the importance of an industry in terms of value-added, financial development, the importance of the banking sector, economic development, economic openness, and alignment with the Euro area. Our empirical results show that both industry and country-specific factors play an important role with industry-specific factors dominating country-specific factors.

Specifically, the change of European market dependence depends mainly on an industry's export intensity and interest rate sensitivity, where higher export intensity and interest rate sensitivity are associated with a stronger propensity to exhibit an increase in dependence. In addition, an industry's competitiveness and a country's financial development and economic openness are also (but less strongly) related to the change in cross-market dependence. These results have important policy implications since the identified determinants of dependence such as export intensity, competitiveness or financial development can be affected by policy. To illustrate, the current discussions between the European Union and the United States about the Transatlantic Trade and Investment Partnership (TTIP) should affect the exports and competitiveness of firms in the Euro area and thus the level of dependence or integration.

These new findings with regard to the impact of the Euro on financial market dependence in Europe in general and on different industries in particular complement prior studies on macroeconomic determinants of financial market dependence/integration. For example, Kalemli-Ozcan et al. (2010) and Fratzscher (2002) find that European equity markets have become more integrated since 1996 and that integration is associated with reduced exchange rate volatility and convergence of interest rates. Hardouvelis et al. (2006) examine whether the convergence of European economies towards the EMU and the launch of the Euro have led to an increase in stock market integration and indicate that the interest rate differential plays an important role for the degree of integration. Danthine et al. (2001) show that lower cost of cross-country transactions and improved liquidity, breadth, and depth of markets have advanced the integration of European financial markets. Kim et al. (2005), Bartram et al. (2007), and Cappiello et al. (2010) also find a clear shift in European stock market dependence associated with the introduction of the EMU using different econometric approaches, while Bekaert et al. (2013) dismiss such an effect. Bartram et al. (2007) study changes in the dependence between countries in the context of the Euro using a conditional copula dependence model, but do not analyze industries or potential drivers of dependence.

The remainder of the paper is organized as follows: Section 2 studies the changes in the dependence between European industries over time, while Section 3 investigates the determinants of European market dependence. Section 4 concludes.

2. European equity market dependence

2.1. Related literature and hypotheses

The introduction of the Euro as a common currency was a project drawn up by the leaders of the EU to advance the goal of a closer union among European countries. It was identified by the Delors Report as a further step toward the creation of a single European market in order to create price stability, reduce costs of

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[3] Pukthuanthong and Roll (2009) use a two-factor model to show that in the case of perfect integration, the correlation of the returns of two markets is less than 1 if the factor sensitivities of the two returns are not linear to each other for both factors.

[4] Assessing market integration can be based on asset pricing models (see, e.g., Errunza and Losq, 1985; Bekaert and Harvey, 1995; Rockinger and Urga, 2001; Carrieri et al., 2004; Hardouvelis et al., 2006; Cappiello et al., 2008; Pukthuanthong and Roll, 2009) or measures of market comovement or dependence (see, e.g., Dumas et al., 2003; Bekaert et al., 2005; Kim et al., 2005, 2006; Cappiello et al., 2006, 2010; Eiling and Gerard, 2014). While financial market integration is well defined by the existence of a common pricing kernel for all assets, many researchers in economics and finance have established relations between cross-market dependence and equity market integration. Following the theoretical foundations proposed by Dumas et al. (2003), Aydemir (2005), Cappiello et al. (2006, 2010) and Eiling and Gerard (2014) use factor models to link measures of dependence and indicators of financial integration. In addition, Goetzmann et al. (2005) document positive causality from market integration to market dependence. Therefore, a likely source of increases in equity market dependence consists in higher degrees of integration between markets.