VOLATILITIES AND EQUITY MARKET RETURNS IN EUROPE: AN INVESTIGATION USING EXCHANGE TRADED FUNDS

Lidija Dedi, University of Zagreb, Faculty of Economics and Business, J.F. Kennedy sq. 6, 10000 Zagreb, Croatia, +385-1-238-3109, lidija.dedi@efzg.hr

Burhan F. Yavas, California State University-Dominguez Hills, Carson, CA 90747, USA, 310-243-3501 byavas@csudh.edu

Demos Vardiabasis, Pepperdine University, GSBM LA CA 90045, USA 310-568-5500 demosvardiabasis@yahoo.com

ABSTRACT

We study equity market return and volatility spillovers using regression and GARCH methodologies in France, Germany, Italy, Spain and Switzerland during the period of 2005-2015. Findings indicate significant return co-movements and volatility transmissions in most of the countries in the sample except Italy and Spain. Also, volatilities persists longer periods in some countries (Spain and Italy) than others (Germany and Switzerland). Findings are elaborated upon and implications and recommendations provided for individuals and companies for diversification and risk reduction.

INTRODUCTION

This paper investigates the linkages among equity returns and transmission of volatilities. The sample consists of five European countries: France, Germany, Italy, Spain and Switzerland. The selection was made on the basis of close economic relationships (trade and finance) among the sample countries with the objective of investigating market returns and volatilities during a 10 year period that includes 2007-2008 financial crisis. One of the reasons for the selection was to study market co-movements between and among stronger countries of the EU (France and Germany), weaker countries (Italy and Spain) and a neutral country (Switzerland) during pre and post financial crisis. The study continues our previous research on the same topic but extends it both in terms of the countries studied and the time period included.

The growth in global integration of financial markets has given rise to many studies that investigate the mechanism through which equity market movements are transmitted around the world. These studies make it clear that while real economic conditions and equity market performances are linked, the performance of equity markets vary based on international factors, so that market performance is not perfectly correlated across countries.

Much of the earlier research in international stock markets concentrated exclusively on co-movement between returns Bekaert et al. [2]; Kim and Langrin [12]; Rezayat and Yavas [21]; Yavas and Rezayat, [24]. These studies found low correlations across some country equity markets which provide attractive diversification opportunities. Kiymaz [13] and Kiymaz [14] found existence of potential diversification benefits both in markets in Latin America as well as in the European and African/Middle Eastern frontier markets. Similarly, Gray [8] found financial contagion among emerging European Union countries and their linkages strengthen after the 2007 crisis.

More recent research [5] [17] [20] demonstrated that important information is revealed in the volatility of stock prices in addition to their movements. The interest in volatilities has also increased after the two recent stock market crashes (dot.com of 2000 and financial crisis of 2007-2008) which witnessed wide swings in asset prices. However, academic research on equity market volatility transmission has not been conclusive. For example, Schleicher [22] indicated that equity markets' return co-movements were significant but not their volatilities. Li [19] examined the linkages between Shanghai and Shenzhen stock exchanges of China, Hong Kong and the United States, and found no spillovers (return and volatility) between the stock exchanges in China and U.S. markets. Hamao et al. [9], Christofi and Pericli [4], Kumar and Mukhopadyay [16], and Kim [11] found intra-regional volatility spillovers to be more significant than the inter-regional spillovers.

The main idea in this paper is to explore price and volatility linkages among the selected country ETFs. In doing so, the study contributes to prevalent notable contributions on country ETFs such as those by [15] [23] [10] [18]. Other studies similar to the present one include Abbas et al. [1] which investigates the presence of volatility transmission among regional equity markets of Pakistan, China, India, and Sri Lanka in addition to the developed countries (USA, UK, Singapore, and Japan). Diebold and Yilmaz [5] provide an empirical analysis of return and volatility spillovers among five equity markets in the Americas: Argentina, Brazil, Chile, Mexico and the U.S. The results indicate that both return and volatility spillovers vary widely. Return spillovers, however, tend to evolve gradually, whereas volatility spillovers display clear bursts that often correspond closely to economic events.

The literature review summarized above has revealed several gaps. First, almost all of the papers reviewed utilized stock market indices as opposed to ETFs used in this study. Second, we study multi-directional flows whereas most of the literature focuses on uni-directional flows from the developed to developing markets. Finally, the methodology is somewhat different (vector auto-regression (VAR) as opposed to stepwise regression) even though the present paper also uses GARCH methodology like most of the other studies. The present paper also addresses the questions of "volatility persistence" in addition to "volatility transmission".

DATA AND METHODOLOGY

This study utilizes Exchange Traded Funds (ETF) instead of market indices. ETFs are arguably one of the most versatile of financial instruments that invest mostly in corporate and sovereign liabilities with the intension of replicating the returns of a market index. This paper utilizes iShares MSCI Capped/Core Equity ETFs (all Equity ETFs subject to this research are issued by iShares). "iShares" is the largest ETF provider in the world. It is part of BlackRock, the world's largest asset manager. Selected ETFs seek to track the investment results of a particular index. For example, ETF-USA (iShares Core S&P 500 ETF - IVV) seeks to track the investment results of an index composed of large-capitalization U.S. equities S&P 500.

The data period is from September 23, 2005 to September 18, 2015, a sample of 522 weeks on the following ETFs: 1. *The iShares MSCI France Capped ETF (EWQ)* seeks to track the investment results of a broad-based index composed of French equities: 2. *The iShares MSCI Germany ETF (EWG)* tracks the performance of publicly traded securities in the MSCI Germany market index. 3. *The iShares MSCI Italy Capped ETF (EWI)* seeks to track the investment results of a broad-based index composed of Italian equities. 4. *The iShares MSCI Spain Capped ETF (EWP)* seeks to track the investment results of

an index composed of Spanish equities. 5. *The iShares MSCI Switzerland ETF (EWL)* seeks to track the investment results of a broad-based index composed of Swiss equities.

By concentrating the analysis on ETF data, we can mitigate if not entirely avoid some substantial problems that arise in traditional academic research such as exchange rates volatility, divergences in the national tax systems, diversities in stock exchange trading times and bank holidays, restrictions on cross-border trading and investments, transaction costs. Designed to mimic the movements of MSCI indices, ETFs provide an easy pool of international diversification products for an investor.

To study co-movements of daily returns, we utilized the stepwise regression methods. To measure the dynamic relationship of the volatility of a process, on the other hand we used generalized autoregressive conditional heteroskedastic (GARCH) models. The reader is referred to Engle [7] and Bollerslev [3] for additional information on GARCH models.

Table 1 below summarizes stepwise regression results:

Table 1: Co-movements of daily ETF Returns (stepwise regression)

$$r_{t(France)} = 0.466 r_{t(Germany)} + 0.246 r_{t(Italy)} + 0.207 r_{t(Swiss)} + 0.101 r_{t(Spain)} + e_t$$

$$r_{t(Germany)} = 0.896 r_{t(France)} + 0.104 r_{t(Swiss)} - 0.117 r_{t-1(Swiss)} + 0.081 r_{t-1(France)} + e_t$$

$$r_{t(Italy)} = 0.624 r_{t(France)} + 0.418 r_{t(Spain)} + 0.054 r_{t-1(Swiss)} + e_t$$

$$r_{t(Spain)} = 0.616 r_{t(Italy)} + 0.352 r_{t(France)} - 0.152 r_{t-1(Swiss)} + 0.089 r_{t-1(France)} + e_t$$

$$r_{t(Swiss)} = 0.125 + 0.544 r_{t(France)} + 0.135 r_{t(Germany)} - 0.177 r_{t-1(Swiss)} + 0.119 r_{t-1(France)} + e_t$$

The results of the analysis show the existence of significant co-movements of returns among the countries in the sample. ETF returns in France and Switzerland affect returns in all of the other sample countries. Most of the coefficients are positive indicating that the markets move together, French returns are positively related to the returns from other countries in the sample while German returns are affected only by returns from France and Switzerland while the latter is affected only by French and German returns. Spanish and Italian returns move together but investors from both countries can benefit in diversifying into Switzerland and Germany. Clearly there are other diversification opportunities: German investors can safely diversify by investing in Italy and Spain; Swiss investors can benefit by investing also in Italy and Spain; Spanish and Italian investors are better off staying clear of each other's markets as well as that of France.

Turning to volatilities, we observe that the highest volatility (in terms of standard deviation) during the period of our study is exhibited by Italy (4.086) and Spain (4.084). On the other hand, the Swiss market has the lowest volatilities.

To analyze persistence in volatility we used GARCH (1,1) model. As it is shown in table 2, Switzerland and Germany have the highest ARCH coefficient (.0955 and .0952) but on the other hand, both markets have the lowest GARCH coefficient (0.8532 and 0.8604) indicating strong shocks in the short term but at the same time these strong short term shocks do not contribute to long run volatility persistence. Looking at both ARCH and GARCH effects, Italy and Spain have the highest α plus β values, indicating that the effects of the volatility shocks fade away slowly. On the other hand, volatility in Switzerland and Germany do not persist very long (the lowest value of GARCH and ARCH).

Table 2: Volatility Persistence

coefficient	France	Germany	Italy	Spain	Swiss
Constant (α_0)	0.2942 (0.088)	0.5381 (0.063)	0.2547 (0.082)	0.3544 (0.048)	0.3372 (0.047)
ARCH(-1) (α_1)	0.0909 (0.003)	0.0952 (0.003)	0.0926 (0.001)	0.0873 (0.003)	0.0955 (0.009)
Garch(-1) (β_1)	0.8863 (0.000)	0.8604 (0.000)	0.8941 (0.000)	0.8926 (0.000)	0.8532 (0.000)
$\alpha_1 + \beta_1 < 1$	0.9772	0.9556	0.9866	0.9799	0.9487

VOLATILITY TRANSMISSION

To detect transmission of volatility between stock markets, we use the Augmented GARCH model as developed by Duan [6]. The findings are indicated in the Table 3:

Table 3: Volatility transmission

$$\sigma^2_{t(France)} = 0.9740 + 0.7829\sigma^2_{t-1(France)} + 0.1834r^2_{t-1(Italy)} - 0.0681r^2_{t-1(Spain)}$$

$$\sigma^2_{t(Germany)} = 1.2004 + 0.7654\sigma^2_{t-1(Germany)} + 0.1969r^2_{t-1(Italy)} - 0.0816r^2_{t-1(Spain)}$$

$$\sigma^2_{t(Italy)} = 0.3209 + 0.1099e^2_{t-1(Italy)} + 0.8749\sigma^2_{t-1(Italy)}$$

$$\sigma^2_{t(Spain))} = 0.4859 + 0.8594\sigma^2_{t-1(Spain)} + 0.1192r^2_{t-1(Italy)}$$

$$\sigma^2_{t(Swiss)} = 0.8819 + 0.67906\sigma^2_{t-1(Swiss)} + 0.0562r^2_{t-1(Germany)} + 0.0974r^2_{t-1(Italy)} - 0.0528r^2_{t-1(Spain)}$$

*variance regressors – one-period lagged squared returns for all countries in the group

Furthermore, there is an evidence of volatility spillovers. France and Germany both experience volatility spillovers only from Italy and Spain but not from each other. Switzerland experiences volatility spillovers from Italy, Spain and Germany. The results show that the only two markets not experiencing volatility spillovers from other markets are Italy and Spain.

CONCLUSIONS

This paper studied the transmission of equity returns and volatility among five equity markets using weekly ETF data. A stepwise regression model along with a generalized autoregressive conditional heteroskedasticity (GARCH) model is used to identify the source and magnitude of return and volatility spillovers.

The findings of this study indicate that co-movements between daily ETF returns representing the countries under study are significant. Therefore, there are diminishing opportunities for investors to diversify their portfolios. Nevertheless, one could still find significant diversification possibilities for investors. For example, German investors can safely diversify by investing in Italy and Spain; Swiss investors can benefit by investing also in Italy and Spain; Spanish and Italian investors are better off staying clear of each other's markets as well as that of France.

Another finding of the study indicates that among the sample countries, Italy and Spain are more volatile than the more developed markets (France Germany) while Switzerland is the least volatile.

There is also strong evidence of volatility spillovers. France and Germany both experience volatility spillovers from Italy and Spain while Switzerland experiences volatility spillovers from Italy, Spain and Germany. The results show that the only two markets not experiencing volatility spillovers from other markets are Italy and Spain.

Given that volatilities can proxy for risk, there are implications for both individual and institutional investors in terms of further examining pricing securities, hedging and other trading strategies as well as framing regulatory policies. Clearly, volatility transmission and the time-varying nature of volatility have implications for investors and portfolio managers who assess such information and rebalance their portfolios continually to achieve efficient portfolio diversification. The information is also important for policymakers interested in financial stability.

REFERENCES

[1] Abbas, Q, Khan, S and Shah, Z. (2013). *"Volatility transmission in regional Asian stock markets,"* *Emerging Markets Review*, 16, issue C: 66-77

[2] Bekaert G., Hodrick, Robert J., Zhang, Xiaoyan (2009), "International Stock Return Comovements," *Journal of Finance*, American Finance Association, vol. 64(6), pages 2591-2626, December.

[3] Bollerslev, T. (1986), "Generalized Autoregressive Conditional Heteroskedasticity," *Journal of Econometrics*, 31(3): 307-327.

[4] Christofi, A., and Pericli, A (1999), "Correlation in Price Changes and Volatility of Major Latin American Stock Markets," *Journal of Multinational Financial Management*, 9:79–93.

[5] Diebold, F.X. and Yilmaz, K. (2011), "Equity Market Spillovers in the Americas," in R. Alfaro (ed.) *Financial Stability, Monetary Policy, and Central Banking*. Santiago: Bank of Chile Central Banking Series, Volume 15, 199-214, 2011.

[6] Duan, J. C. (1997), "Augmented GARCH (p, q) Process and its Diffusion Limit," *Journal of Econometrics* 79: 97-127.

[7] Engle, R F. (1982), "Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of United Kingdom Inflation," *Econometrica* 50:987–1007.

[8] Gray, D. (2009), "Financial contagion among members of the EU-8: a cointegration and Granger causality approach", *International Journal of Emerging Markets*, Vol. 4 No. 4, pp. 299–314.

[9] Hamao, Y., Masulis, R. W., and Ng, V. (1990), "Correlations in Price Changes and Volatility across International Stock Markets," *The Review of Financial Studies*, 3 (2): 281-307.

[10] Hughen J.C. and Mathew, P.G (2007) "The Efficiency of International Information Flow: Evidence from the ETF and CEF Prices," http://ssrn.com/abstract=1029844 or http://dx.doi.org/10.2139/ssrn.1029844

[11] Kim S. J., (2005) "Information Leadership in the Advanced Asia-Pacific Stock Markets: Return, Volatility and Volume Information Spillovers from the US and Japan," *Journal of the Japanese and International Economies*, 19(3):338-365.

[12] Kim, S. W., and Langrin, R. B (1996), "Stock Price Movements Spillovers under Foreign Exchange Liberalization: The Case of Jamaica, Trinidad and Tobago, and the United States", University of the West Indies, Mona, Jamaica. Presented at the XXVIIth Annual Conference on Monetary Studies.

[13] Kiymaz, H. (2002), "An analysis of linkages among equity markets: study of selected Latin American and Developed countries*", Journal of Economics and Business Studies*, Vol. 1 No. 1, pp. 16–33.

[14] Kiymaz, H. (2003), "Are there diversification benefits from investing in frontier equity markets?" *Journal of Accounting and Finance Research*, Vol. 11 No. 2, pp. 64–75.

[15] Khorana, A., Nellis, E., and Trester, J.J. (1998), "The Emergence of Country Index Funds: An Examination of World Equity Benchmark Shares (WEBS)," *The Journal of Portfolio Management*, 24(4): 78-84

[16] Kumar, K. K., and Mukhopadyay, C. (2002), "A Case of Us and India," NSE Research Paper

[17] Kumar, M. (2013) "Returns and volatility spillover between stock prices and exchange rates: Empirical evidence from IBSA countries", *International Journal of Emerging Markets*, Vol. 8 (2), pp.108 - 128

[18] Levy, A. and Lieberman, F. (2013) "Overreaction of Country ETFs to US Market Returns: Intraday vs. Daily Horizons and the Role of Synchronized Trading" *Journal of Banking and Finance*: 37(5):1412-1421

[19] Li, H. (2007) "International Linkages of the Chinese Stock Exchanges: A Multivariate GARCH Analysis," *Applied Financial Economics*, 17: 285-295.

[20] Rey, H. (2013), "Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence" www.kc.frb.org/publicat/sympos/2013/2013Rey.pdf

[21] Rezayat, F. and Yavas, B.F. (2006), "International Portfolio Diversification: A Study of Linkages among the U.S., European and Japanese Equity Markets," *Journal of Multinational Financial Management*, 16: 440-458.

[22] Schleicher, M. (2001), "The Co-movements of Stock Markets in Hungary, Poland and the Czech Republic," *International Journal of Finance and Economics,* 6: 27-39.

[23] Tse Y., and Martinez, V. (2007) "Price Discovery and informational efficiency of International Ishares funds," *Global Finance Journal*, 18: 1-15.

[24] Yavas, B. F. and Rezayat, F. (2008), "Integration among Global Equity Markets: Portfolio Diversification using Exchange-Traded Funds," *Investment Management & Financial Innovations*. 5(3):30-43.

WEB REFERENCES
www.i-shares.com