Effects of Economic Policy Uncertainty Shocks on the Long-Run US-UK Stock Market Correlation

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CREATES Research Paper 2016-29

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[1] Asgharian and Hou thank the Jan Wallander and Tom Hedelius Foundations for funding their research. Christiansen acknowledges financial support from The Danish Council of Independent Research (DFF – 4003-00022) and CREATES (Center for Research in Econometric Analysis of Time Series) funded by the Danish National Research Foundation (DNRF78).

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Abstract: We use the economic policy uncertainty indices of Baker, Bloom, and Davis (2016) in combination with the mixed data sampling (MIDAS) approach to investigate the US and UK stock market movements. The long-run US-UK stock market correlation depends positively on US economic policy uncertainty shocks. The US long-run stock market volatility depends significantly on the US economic policy uncertainty shocks but not on UK shocks while the UK depends significantly on both.

Keywords: economic policy uncertainty index; mixed data sampling; stock market correlation; stock market volatility

JEL classifications: G11; G15; G30; C32

1. Introduction

The correlation and co-movement of international stock markets has been investigated in prominent papers such as Longin and Solnik (1995) and Forbes and Rigobon (2002). We continue this research by scrutinizing the long-run correlation between the US and UK stock markets.

We examine the effects of US and UK economic policy uncertainty (EPU) shocks on their long-run stock market volatility and correlation. We use the recent EPU indices of Baker, Bloom, and Davis (2016) which quantifies newspaper coverage of policy-related economic uncertainty, to obtain EPU shocks. We build on a growing line of research applying these economic uncertainty indices. For instance, Pástor and Veronesi (2012) show theoretically that EPU is related to stock market volatility, correlation, and jumps. Pástor and Veronesi (2013) find empirical support that individual US stock volatility and pairwise US stock correlations are higher when economic uncertainty is higher. Kelly, Pástor, and Veronesi (forthcoming) show that EPU also plays a role in the pricing of stock options. Previous research thus leads us to expect that EPU is of importance for international stock market relations.

We apply the mixed data sampling (MIDAS) framework of Ghysels, Santa-Clara, and Valkanov (2005) in order to combine daily stock returns with monthly EPU shocks. This approach allows us to concentrate on the long-run behavior of the correlation. While, real, financial and institutional factors have been utilized in explaining comovements across financial markets, to the best of our knowledge, this is the first attempt to analyze how the long-run volatility and correlation of different equity markets are influenced by economic uncertainty.

2. Data

The sample period is from 1997 to 2016 with the beginning determined by the availability of the EPU index for the UK. For the US stock market, we use the S&P500 total return index and for the UK stock market, we use the FTSE100 total return index. In order to get synchronized daily observations from both markets, we use the last transaction price at 15:00 GMT to make sure both markets are open. The intra-daily transaction prices are collected from the Thomson Reuters SIRCA database.

The news-based EPU indices for the US and UK are freely available at the monthly frequency from Baker, Bloom, and Davis (2016). The index quantifies newspaper coverage of policy-related economic uncertainty. We use log first differences of the economic policy indices as these reflect EPU shocks cf. Li, Zhang, and Gao (2015).

3. Econometric Methodology

We use the two-step DCC-MIDAS model of Colacito, Engle, and Ghysels (2011) extended to allow for exogeneous variables influencing the long-run volatility and correlation as in Asgharian, Christiansen, and Hou (2016). The first step consists of estimating separate GARCH-MIDAS models for the US and UK stock returns for day i=1,.,.N_t in month t as:

$$r_{i,t-1} = \mu + \sqrt{\tau_t g_{i,t}}\varepsilon_{i,t} \qquad \varepsilon_{i,t} \sim (0,1) \tag{1}$$

The total stock variance $\sigma_{i,t}^2$ is separated into a short-run component $g_{i,t}$ and a long-run component τ_t such that $\sigma_{i,t}^2 = \tau_t g_{i,t}$. A GARCH (1,1) process describes the short-run component:

$$g_{i,t} = (1 - \alpha - \beta) + \alpha \frac{(r_{i,t-1} - \mu)^2}{\tau_t} + \beta g_{i-1,t} \tag{2}$$

where $\alpha > 0$ and $\beta \geqslant 0$, $\alpha + \beta < 1$. The long-run component is described by a MIDAS regression where the lagged EPU shocks of the US and/or the UK (EPU_{t-k}) are included (k=1,..,24).

$$\log(\tau_t) = \theta_0 + \theta_{US} \sum_{k=1}^{K} \varphi_{US,k} EPU_{US,t-k} + \theta_{UK} \sum_{k=1}^{K} \varphi_{UK,k} EPU_{UK,t-k} \tag{3}$$

The weighting scheme used in eq. (3) is described by a beta lag polynomial:

$$\varphi_k(w_1, w_2) = \frac{\left({}^{k}/_{K}\right)^{w_1-1}\left(1-{}^{k}/_{K}\right)^{w_2-1}}{\sum_{j=1}^{K}\left({}^{k}/_{K}\right)^{w_1-1}\left(1-{}^{k}/_{K}\right)^{w_2-1}}, k = 1, \ldots, K. \tag{4}$$

The parameters θ_{US} and θ_{UK} measure the effects of the US and UK economic policy uncertainty shocks on the long-run volatility. We fix $w_1 = 1$ to ensure higher weights to the most recent observations.

In the second step, we estimate the DCC-MIDAS specification for the US-UK stock market correlation using the standardized residuals ($\xi_{US,i,t}$ and $\xi_{UK,i,t}$) from the first step.

$$q_{i,t} = \bar{\rho}_t(1 - a - b) + a\xi_{US,i-1,t}\xi_{UK,i-1,t} + bq_{i-1,t}$$

$$\bar{\rho}_t = \frac{exp(2\bar{z}_t) + 1}{exp(2\bar{z}_t) - 1}$$

$$\bar{z}_t = \gamma_0 + \gamma_{US} \sum_{k=1}^{K} \delta_{US,k} EPU_{US,t-k} + \gamma_{UK} \sum_{k=1}^{K} \delta_{UK,k} EPU_{UK,t-k} \quad (5)$$

$q_{i,t}$ is the short-run correlation, $\bar{\rho}_t$ is a slowly moving long-run correlation (k=1,..,60). γ_{US} and γ_{UK} measure the effects of the US and UK economic policy uncertiantiy on the long-run correlation, and $\delta_{US,k}$ and $\delta_{UK,k}$ are the corresponding weight schemes, defined in equation 4.

4. Results and Analyses

Table 1 shows the results for the volatility models. The long-run US volatility depends positively and significantly on the US EPU such that the larger the economic uncertainty is, the larger is the long-run US volatility. As expected the UK economic uncertainty has no influence on the long-run US volatility, as θ_{UK} is insignificant. When both the US and UK EPU are included, it is only the US that has a significant impact on long-run US volatility. The long-run UK volatility depends strongly upon the UK EPU. The long-run UK stock volatility also depends positively on the US EPU. When we consider US and UK EPU jointly, they are both significant for explaining long-run UK stock volatility. Yet, the US has a larger coefficient. This may be due to the more importance of US economic policy for UK stock market or could indicate that the measure of economic uncertainty is more precise for the US than for the UK. Panels A and B of Figure 1 show the long-run volatilities from the various specifications. For comparison, we plot the political uncertainty indices for the US and the UK in Figure 2. For both stock markets, the variation in the long-run volatility is most pronounced when both US and UK EPU shocks have been accounted. More specifically, the estimated US volatility follows closely the US uncertainty index and reflects the uncertainty spikes related to extreme events such as 9/11, the Lehman Brothers failure in 2008, the debt ceiling fight in 2011, and the Fiscal Cliff in 2012. The UK volatility mostly follows the pattern of the US uncertainty index, when both indices are included.

Table 2 shows the results for the correlation models. There is correspondence between the included exogenous variables in the volatility and correlation models. The long-run US-UK stock volatility depends positively and significantly on the US economic uncertainty shocks. Similarly, the long-run US-UK stock volatility also depends positively and significantly on the UK EPU shocks. When we account jointly for the US and UK economic policy uncertainty, only the US shocks remain significant. So, for the long-run correlation, it is really the state of the US economy that is of importance. Panel C of Figure 1 shows the long-run correlations for the various specifications. The correlation has almost the same overall pattern no matter the choice of the uncertainty index, but the variability is strongest when accounting for both US and UK economic uncertainty shocks. In general, the correlation is higher in periods with higher uncertainty (see Figure 2).

6. Conclusion

We investigate the importance of EPU for the long-run US and UK stock market movements. We use the MIDAS framework to decompose the volatility and correlation into long-run and short-run components. The US long-run stock market volatility depends significantly on own EPU shocks while the UK depends significantly on both countries' EPU. The long-run US-UK stock market correlation is strongly and positively related to the US EPU shocks. Overall, the results suggest that UK investors need mainly to concern about US policy uncertainty, even when investing in a domestic stock portfolio.

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Table 1: Univariate GARCH-MIDAS estimation of the time-varying variances

The table reports the results of the GARCH-MIDAS model for the US and UK return variances. The estimations are based on daily returns (1997 to 2016) and monthly EPU's. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

		μ	α	β	θ_0	θ_{US}	$w_{2,US}$	θ_{UK}	$w_{2,UK}$	AIC
US	***Model* 1**	0.008***	0.115***	0.823***	-3.739***	3.888***	1.065***			-11640
		0.002	*0.006*	*0.011*	*0.060*	0.613	0.092			
	***Model* 2**	0.007***	0.093***	0.898***	-3.294***			0.674	1.000***	-11583
		0.002	*0.004*	*0.001*	*0.344*			*0.662*	*0.000*	
	***Model* 3**	0.007***	0.099***	0.887***	-3.366***	2.159***	1.001***	0.956	1.000***	-11643
		0.002	*0.005*	*0.002*	*0.235*	*0.691*	*0.350*	*0.735*	*0.000*	
UK	***Model* 1**	0.005**	0.104***	0.884***	-3.306***	1.091**	1.001***			-11359
		0.002	*0.004*	*0.002*	*0.267*	*0.555*	*0.000*			
	***Model* 2**	0.004**	0.102***	0.886***	-3.329***			1.466**	1.001***	-11358
		0.002	*0.004*	*0.002*	*0.256*			*0.688*	*0.000*	
	***Model* 3**	0.004**	0.077***	0.904***	-3.684***	3.403***	1.103***	0.659***	1.000***	-11363
		0.002	*0.003*	*0.004*	*0.103*	*0.698*	*0.105*	*0.170*	*0.000*	

Table 2: DCC-MIDAS estimation of the time-varying correlation

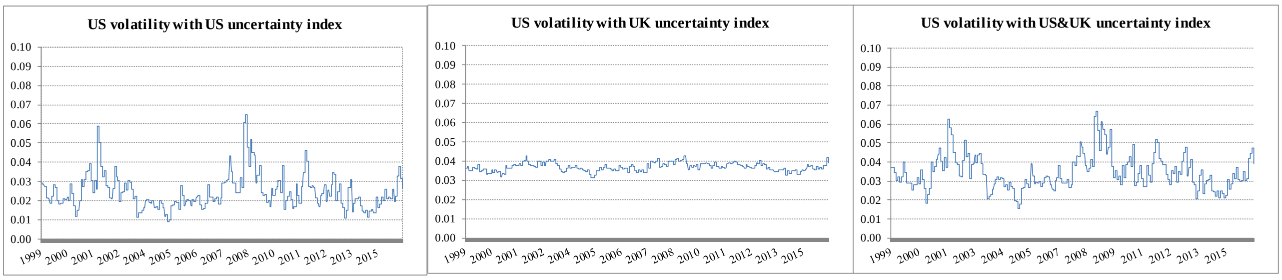
The table reports the results of the DCC-MIDAS model for the US-UK return correlation, with weights defined in equation 4). The estimations are based on daily returns (1997 to 2016) and monthly EPU's. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	a	b	γ_0	γ_{US}	$w_{2,US}$	γ_{UK}	$w_{2,UK}$	**AIC**
***Model* 1**	0.030***	0.920***	1.163***	2.338***	1.031***			20058
	0.005	*0.014*	*0.023*	*0.631*	*0.189*			
***Model* 2**	0.032***	0.939***	1.165***			2.254***	1.219***	20012
	0.004	*0.009*	*0.029*			*0.821*	*0.324*	
***Model* 3**	0.029***	0.923***	1.182***	4.188***	1.207***	-1.037	1.562	20012
	0.005	*0.015*	*0.024*	*1.281*	*0.207*	*1.244*	*1.058*	

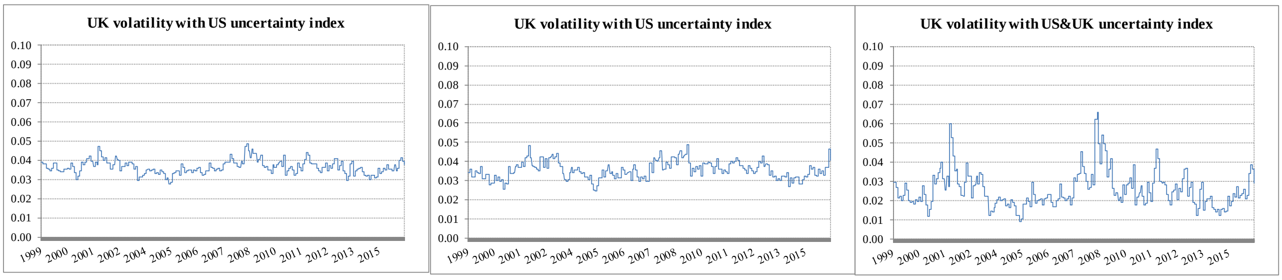
Figure 1. The long-run component of the US and UK variances and correlation

The figures show the long-run components of the US and UK variances and correlation. The left / middle / right figure show the estimations using the US / UK / US and UK EPU's in the MIDAS model.

Panel A. US volatility



Panel B. UK volatility



Panel C. US-UK correlation

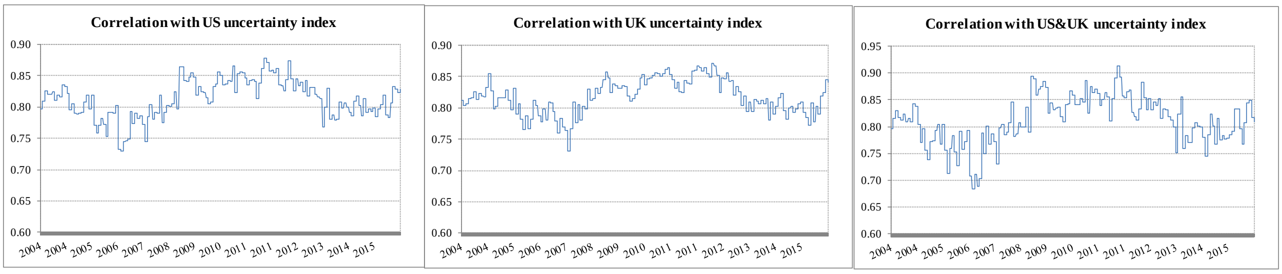
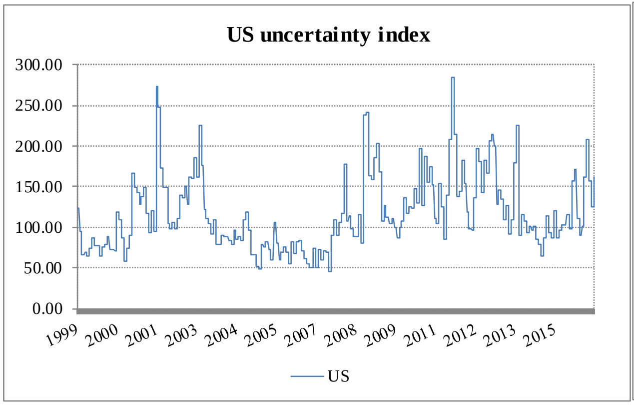
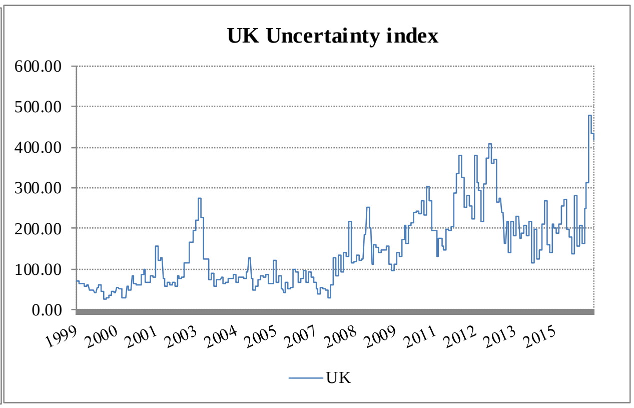


Figure 2. US and UK economic policy uncertainty

The figure shows the monthly observations of the US and UK EPU's.





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