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Detecting Contagion with Correlation: Volatility and Timing Matter*

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Abstract

We examine whether contagion tests are affected by controls for volatility clustering and the collection of synchronized data sets. Without controlling for volatility clustering synchronization does not apparently matter. Once volatility clustering is accounted for synchronized data dramatically changes results.

Keywords: Contagion, interdependence, timing, volatility spillover

JEL Classification: G01, C22, G15, C51.

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1 Introduction

Contagion between asset markets during financial crises is defined as the transmission of shocks via newly opened channels associated with crisis events. Many existing contagion tests rely in some form on detecting changes in correlation between asset returns when markets enter a crisis period, as surveyed in Dungey et al (2005). Contagion effects may be evidenced as increased correlation, such as in the theoretical models of Kodres and Pritsker (2002), or as lower correlation consistent with breaking linkages between financial institutions as proposed in network theory; see Allen and Babus (2008).

Detecting contagion effects relies upon two important determinants. The first is controlling for changes in volatility in common effects. Forbes and Rigobon (2002) suggest a correlation coefficient based test which adjusts for the increase in general market volatility during crisis periods. Without this adjustment unconditional correlation tests will be biased towards the detection of contagion effects. However, this test does not control for the well-known volatility clustering of financial market data. This paper considers whether controlling for volatility clustering results in different outcomes for tests of transmission between countries during times of financial crisis by comparing the results of the Forbes and Rigobon test with those of the Hong (2001) volatility spillover test.

The second potentially important determinant of contagion outcomes is in the timing of the collected data. Efficient market theories support that markets reflect news simultaneously, so that tests which compare data separated in time are likely to contain bias, as demonstrated by Martens and Poon (2001) for correlation coefficients. In contagion studies it is common to compare data from different time zones: Forbes and Rigobon (2002) use a two day moving average and Dungey et al (2005) lag North American markets by one day when comparing with Asian markets. Kleimeier, Lehnert and Verschoor (2008) address this issue using the Forbes and Rigobon test and find that although the calculated coefficients change, the result of no contagion between most markets was retained.

This paper examines the evidence for contagion from the US to European equity markets during the global financial crisis of 2007-2009. Forbes and Rigobon and Hong tests are applied to a non-synchronized dataset on closing market prices, and a synchronized dataset of 16:00GMT market prices. The results strongly indicate the importance of controlling for both volatility clustering and timing of the data. Changing from non-synchronized to synchronized data does not greatly affect the conclusions of the Forbes and Rigobon test, while the Hong test finds more contagion than the Forbes and Rigobon test in both cases. In the non-synchronized dataset the Hong test regularly produces evidence of significant transmissions, while with synchronized data there is very little significant evidence for transmission.

1.1 The tests

The Forbes and Rigobon test is applied to returns on two assets, $\{r_{1,t}, r_{2,t}\}$ which have been filtered via a VAR(1). Under the null hypothesis of no contagion, the correlation coefficients of these returns from the VAR(1) do not change between a crisis and noncrisis period, that is $\mathrm{H}_0 = p_{nc} = v_c$ where p_{nc} is the non-crisis period correlation coefficient and v_c represents the crisis period correlation coefficient adjusted for heteroskedasticity

$$v_c = \frac{\hat{p}c}{\sqrt{1 + (\frac{s_c^2 - s_{nc}^2}{s_{nc}^2})(1 - \hat{p}_c)^2}} \tag{1}$$

where p_c is the crisis sample correlation coefficient, and s^2 denotes the appropriate sample variances. Under the null hypothesis of no contagion the Forbes and Rigobon statistic is

$$FR = \frac{\frac{1}{2}\ln\left(\frac{1+\hat{v}_c}{1-\hat{v}_c}\right) - \frac{1}{2}\ln\left(\frac{\hat{p}_{nc}}{1-\hat{p}_{nc}}\right)}{\sqrt{\frac{1}{T_c-3} + \frac{1}{T_{nc}-3}}} \,\tilde{}\, N(0,1) \tag{2}$$

where T_c and T_{nc} are the number of observations in the crisis and non-crisis periods respectively.

The Hong (2001) test is an extension of the Cheung and Ng (1996) test for causality in variance, based on cross correlations of conditional variances obtained from univariate GARCH processes. It involves lagged mean effects from other markets, and can be viewed as being parallel to the Forbes and Rigobon test while controlling for volatility clustering. An advantage of the Hong test is that it does not rely on a priori exogeneity assumptions, as required in the Forbes and Rigobon test, but determines the direction of transmission.

The test procedure involves estimating univariate GARCH(p,q) models including one-lagged returns from other markets and testing the correlations between the resulting standardized conditional variances. Defining $r_{i,t}$ as the return series of interest, with $r_{j,t}$ as the other market under consideration

$$r_{i,t} = \phi_0 + \phi_1 D_t + \phi_2 r_{i,t-1} + \phi_3 D r_{i,t-1} + \phi_4 r j_{,t-1} + \phi_5 D r_{j,t-1} + z_t \tag{3}$$

$$h_{i,t} = \kappa_0 + \sum_{s=1}^{p} \alpha_s h_{t-s} + \sum_{s=1}^{q} \beta_s \varepsilon_{t-s}^2$$

where $\varepsilon_{i,t} \sim$ idd(0, h$_t$), and D_t is a dummy variable taking the value 1 during the exogenously defined crisis period and 0 otherwise. Let , I_{it}, $i = 1, 2$ be the information set defined as $I_{it} = \{R_{ij}, j \succeq 0\}$, $I_t = I_{1t} \cup I_{2t}$ so that $E(\varepsilon_{it} \,|I_{it-1}) = 0$ and $E(\varepsilon_{it}^2 \,|I_{it-1}) = 1$. The Hong (2001) null hypothesis for no causality in time varying conditional variances can be written as:

$$H_0: \ \mathrm{Var}(z_{1t} \,|I_{1t-1}) = \mathrm{Var}(z_{1t} \,|I_{t-1})$$

The one-sided test statistic proposed by Hong is given as:

$$Q = \frac{\{T \sum w^2(k/M) p_{uv}^2(k) - c(w)\}}{(2D(w))^{1/2}} \,\tilde{}\, N(0,1) \tag{4}$$

$$C(w): \ \sum_{k=1}^{T-1} (1 - k/T) w^2(k/M)$$

$$D(w): \ \sum_{k=1}^{T-1} (1 - k/T)[1 - (j+1)/T] w^4(k/M)$$

where $\hat{\mu}_t = \hat{z}_{1t}^2 / \hat{h}_{1t}$ and $\hat{\nu}_t = \hat{z}_{2t}^2 / \hat{h}_{2t}$ are the centered squared standardized residuals from the GARCH (p,q) estimates on a sample size of T, with a sample cross-correlation at lag k, given by

$$p_{uv}(k) = \frac{c_{uv}(k)}{\sqrt{T - 2\sum_{t=1}^{T} \hat{\mu}_t^2 \sum_{t=1}^{T} \hat{\nu}_t^2}} \tag{5}$$

with sample covariances

$$c_{uv}(k) = T^{-1} \sum_{k=1+1}^{T-1} \hat{\mu}_t \hat{\nu}_{t-k}, k \geq 0$$

and

$$c_{uv}(k) = T^{-1} \sum_{k=1+1}^{T-1} \hat{\mu}_t \hat{\nu}_{t+k}, k < 0.$$

The function w(.) is a weighting function for which we explored the use of the Bartlett, Daniell and Truncated kernels, and M is the number of cross correlations included.

2 Data

The data consist of stock market returns for the UK FTSE100, the US S&P500 and seven European indices for local closing times (the CP dataset) and for 16:00 GMT times (the 4^{pm} dataset). The European indices considered are for the markets located in Austria, France, Germany, Italy, Netherlands and Switzerland a well as the EU wide index. Compound daily returns are calculated as log differences of the stock prices[1].

The sample begins on July 29, 2004, consistent with the previous tightening cycle in the monetary policy cycle in the US, and ends on March 20, 2009. To implement the tests the period is divided into non-crisis and crisis samples, delineated by the start of the crisis period on July 17, 2009. This date corresponds to the announcement by Bear Stearns of the collapse of two hedge funds, and was shortly after followed by suspension of payments by BNP Paribas and increased support facilities by the ECB and Fed in early August 2009.

Some descriptive statistics of the data are presented in Tables 1 and 2. For both CP and 4^{pm} data, the standard deviations of equity market returns for all countries increase between the stable and crisis periods, while mean returns decrease for all countries. The extreme minima and maxima for all countries arise during the crisis period. All markets experience negative daily average returns during the crisis period.

Tables 3 and 4 provide the covariance structure for the nine countries equity returns during the pre-crisis and crisis periods respectively. It is clear that both variance and covariance between equity returns raises in crises period for both 4^{pm} and CP data. For example the variance of returns in Austria which is the most dramatic one rises from nearly 1.06% in the pre crisis period to over 6.79% during the crisis period for CP data.

[1]The Datastream codes for the indices at 4pm (Closing prices) are: Austria: AME0E16 (AMSTEOE), EU: DJES516 (DJES50I), France: CAC4016 (FRCAC40), Germany: DAXIN16 (DAXINDX), Italy: ITM3016 (ITMIB30), Netherlands: AME0E16 (AMSTEOE), Swiss: SWIMK16 (SWISSMI), UK: FTSE100 (FTSE100), US: SPCMP16 (S&PCOMP). Daily returns in all series are found to be stationary.

Netherlands, US, France, EU, UK, Italy, Germany and Switzerland follow Austria with variances of under 1% in pre-crisis period to in some cases over 5% in the post-crisis period. Similar patterns are mirrored in the 4^{pm} where the Austrian variance rises from nearly 0.99% in the pre-crisis period to over 6.09% during the crisis. Other countries experience below 1% variance in the pre-crisis period and mainly more than 4% in the crisis period.

The covariances between equity returns also rises from the pre-crisis to crisis periods in both data sets. For the pre-crisis period all covariances are less than 1%, but in the crisis period rise to as large as 4.77% between France and the Netherlands for the CP data, and 4.21% between Austria and the Netherlands for the 4^{pm} data, while the smallest covariance is 2.21% between the US and Switzerland in the CP data.

3 Empirical Findings

This section presents the findings of the different contagion tests, building the case for including both synchronization and appropriate control for heteroskedasticity in determining whether contagion is present in any crisis situation. Table 5 presents the p-values for Forbes and Rigobon test results for the test of no contagion from the US to the other markets using the CP and 4pm data sets, and test results for applying the test to transmissions from the UK to other countries in the data set. The tests find no evidence of significant contagion from either the US or the UK to other countries in either data set.[2]

The p-values for the one sided test results from the Hong tests on standardized residuals from univariate GARCH models are reported in Tables 6 and Table 7. The univariate GARCH results for each asset were selected using AIC criteria and are largely GARCH(1,1). The individual results are not presented in order to preserve space. In applying the Hong test we consider three alternative kernels: the Bartlett, Daniell, and Truncated kernels and three alternative values of M, the extent of cross correlation, here M =5, 10, and 15 for each T. For brevity we report the results for the Daniell kernel and $M = 10$ in detail, as these typify the test results. Full results

[2]Note that we largely solve the endogeneity problem inherent in these pairwise tests by denoting the US and the UK as source countries for the potentially contagious shocks. However, Table 5 does include a result for both US to UK and UK to US based tests, which strictly speaking violate the exogeneity assumption required for these tests. They are advanced here as illustration.

are available on request.

Table 6 presents the results for the null hypothesis of no causality in variance from the US to the European countries, for both the CP and 4^{pm} data. During the non-crisis period there is no evidence of rejection of this hypothesis. The second part of the table presents the results for the null hypothesis of no causality from European countries to the US, and again there is no evidence of rejection of that hypothesis in the non-crisis period.

During the crisis period the non-synchronized data strongly reject the hypothesis of no causality from the US to Europe, but not from the European countries to the US. This is consistent with contagion effects from the US to Europe. However, when the synchronized 4^{pm} data set are used, there is no evidence of significant rejections of the null of no causality in either direction. The use of synchronised data changes the results in an economically meaningful way - when using non-synchronized data contagion effects are evident in the test results, which are simply overcome by using synchronized data which draw on the same information set.

Table 7 presents the results of the tests for causality in variance between the UK and the other sample countries. In both the crisis and non-crisis periods the no causality hypothesis is accepted from European countries to the UK. However, the hypothesis of no causality from the UK to a number of European countries is rejected in the non-crisis period at 10 percent significance, particularly with the CP data set, but only with France and Italy with the 4pm data set. In the crisis period, the null of no causality is rejected for all but Austria, the Netherlands and Switzerland with both the CP and 4pm data.

4 Conclusions

This paper has shown how important controlling for volatility changes, in particular volatility clustering, and synchronization of data sets can be for testing for the existence of crisis transmission effects, that is contagion. The straight forward Forbes and Rigobon test suggests the absence of transmission between all markets in the study, regardless of the synchronicity of the datasets. However, when volatility clustering is accounted for the Hong test suggests significant transmissions between markets, particularly if the data are asynchronous. The results suggest that the less asynchronous data sets between the UK and Europe are less affected than where the time difference is greater, as between the US and Europe. When synchronicity was accounted for the findings of significant causality from the US to Europe, consistent with contagion effects, are overruled. This suggests that empirical work needs to be particularly careful with synchronicity issues in testing for contagion, as once data characteristics such as clustering are accounted for, lack of syncrhonicity in data may drive empirical results.

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Table 1:
Descriptive statistics of daily percentage equity returns for selected periods: Pre-crisis period (29th July 2004 to 16th July 2007), Crisis period (17th July 2007 to 20th March 2009), Total period (29th July 2004 to 20th March 2009).

Country	Sample period	Mean		SDev		Mak		Min		Skewness		Kurtosis	
		CP	4^{pm}	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}
AUSTRIA	Pre-crisis period	0.115	0.115	1.030	0.997	4.672	3.735	-7.768	-7.000	-1.172	-1.195	10.470	9.160
	Crisis period	-0.252	-0.257	2.610	2.472	12.021	10.815	-10.253	-9.447	0.023	-0.193	6.180	5.919
	Total period	-0.018	-0.020	1.782	1.696	12.021	10.815	-10.253	-9.447	-0.378	0.641	11.072	10.514
EU	Pre-crisis period	0.067	0.067	0.804	0.765	2.643	2.362	-3.413	-2.793	-0.304	-0.324	4.333	4.028
	Crisis period	-0.182	-0.183	2.141	2.055	10.438	8.895	-8.208	-8.042	0.206	-0.002	7.382	6.962
	Total period	-0.023	-0.024	1.444	1.384	10.438	8.895	-8.208	-8.042	-0.016	-0.276	13.105	12.521
FRANCE	Pre-crisis period	0.067	0.067	0.808	0.779	2.505	2.453	-3.227	-3.091	-0.327	-0.362	4.255	3.944
	Crisis period	-0.179	-0.180	2.197	2.104	10.595	9.610	-9.472	-8.386	0.305	0.145	7.601	6.939
	Total period	-0.022	-0.022	1.475	1.415	10.595	9.610	-9.472	-8.386	0.107	-0.098	13.643	12.459
GERMANY	Pre-crisis period	0.095	0.095	0.870	0.849	2.605	2.547	-3.463	-2.840	-0.363	-0.333	4.047	3.832
	Crisis period	-0.157	-0.158	2.059	2.071	10.797	10.132	-7.433	-7.967	0.459	0.071	8.993	7.417
	Total period	0.004	0.003	1.425	1.424	10.797	10.132	-7.433	-7.967	0.238	-0.183	14.339	12.329
ITALY	Pre-crisis period	0.057	0.057	0.718	0.675	2.354	1.907	-3.790	-3.263	-0.664	-0.712	5.361	5.002
	Crisis period	-0.227	-0.227	2.075	1.973	10.765	8.317	-8.817	-9.297	0.323	-0.034	8.205	6.819
	Total period	0.045	-0.046	1.381	1.311	10.765	8.317	-8.917	-9.297	0.055	-0.405	15.263	12.979

Table 2:
Descriptive statistics of daily percentage equity returns for selected periods: Pre-crisis period (29th July 2004 to 16th July 2007), Crisis period (17th July 2007 to 20th March 2009), Total period (29th July 2004 to 20th March 2009).

Country	Sample period	Mean		SDev		Mak		Min		Skewness		Kurtosis	
		CP	4^{pm}	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}
NETH.	Pre-crisis period	0.069	0.069	0.758	0.730	2.570	2.486	-3.293	-2.967	-0.368	-0.356	4.752	4.270
	Crisis period	-0.221	-0.222	2.287	2.122	10.028	8.917	-9.590	-8.879	0.051	-0.125	7.541	6.536
	Total period	-0.036	-0.037	1.510	1.411	10.028	8.917	-9.590	-8.879	-0.237	-0.472	14.597	12.461
SWETZ.	Pre-crisis period	0.067	0.067	0.713	0.683	2.614	2.244	-3.455	-3.536	-0.481	-0.452	5.010	4.859
	Crisis period	-0.151	-0.151	1.879	1.872	10.788	7.759	-8.108	-7.386	0.320	0.134	7.349	5.483
	Total period	-0.012	-0.012	1.270	1.256	10.788	7.759	-8.108	-7.386	0.098	-0.118	12.930	10.040
UK	Pre-crisis period	0.054	0.054	0.666	0.666	2.604	2.604	-2.963	-2.963	-0.381	-0.381	4.922	4.922
	Crisis period	-0.127	-0.127	2.061	2.061	9.384	9.384	-9.266	-9.266	0.055	0.055	6.890	6.890
	Total period	-0.012	-0.012	1.352	1.352	9.384	9.384	-9.266	-9.266	-0.151	-0.151	13.644	13.644
US	Pre-crisis period	0.044	0.045	0.649	0.596	2.134	2.005	-3.534	-2.208	-0.249	-0.091	4.553	3.712
	Crisis period	-0.160	-0.157	2.247	2.101	10.957	10.945	-9.470	-10.136	-0.069	0.241	7.336	9.463
	Total period	0.030	-0.028	1.451	1.354	10.957	10.945	-9.470	-10.136	-0.321	0.092	15.440	19.830

Table 3:
Covariance of daily percentage equity returns for Pre-Crisis period (29th July 2004 to 16th July 2007)

Country	AUSTRIA	EU	FRANCE	GERMANY	ITALY	NETH.	SWITH.	UK	US	
4^{pm}										CP
	1.060	**0.504**	**0.512**	**0.528**	**0.458**	**0.470**	**0.434**	**0.434**	**0.186**	*AUSTRIA*
AUSTRIA	0.993	**0.645**	**0.633**	**0.645**	**0.520**	**0.572**	**0.468**	**0.468**	**0.245**	*EU*
EU	0.461	0.585	**0.652**	**0.657**	**0.509**	**0.562**	**0.470**	**0.470**	**0.237**	*FRANCE*
FRANCE	0.476	0.579	0.606	**0.755**	**0.541**	**0.597**	**0.486**	**0.486**	**0.262**	*GERMANY*
GERMANY	0.496	0.626	0.616	0.721	**0.515**	**0.460**	**0.397**	**0.397**	**0.209**	*ITALY*
ITALY	0.423	0.461	0.456	0.491	0.455	**0.573**	**0.429**	**0.429**	**0.218**	*NETH.*
NETH.	0.439	0.522	0.519	0.559	0.413	0.533	**0.379**	**0.379**	**0.174**	*SWITH.*
SWITH.	0.393	0.428	0.434	0.460	0.343	0.399	0.466	**0.443**	**0.190**	*UK*
UK	0.402	0.415	0.421	0.445	0.351	0.385	0.339	0.443	**0.420**	US
US	0.318	0.364	0.359	0.394	0.287	0.331	0.284	0.275	0.355	

Table 4:
Covariance of daily percentage equity returns for Crisis period (17th July 2007 to 20th March 2009)

Country	AUSTRIA	EU	FRANCE	GERMANY	ITALY	NETH.	SWITH.	UK	US	
4^{pm}										CP
	6.798	**4.423**	**4.576**	**4.101**	**4.180**	**4.744**	**3.699**	**4.195**	**2.509**	*AUSTRIA*
AUSTRIA	6.097	**4.571**	**4.610**	**4.195**	**4.188**	**4.612**	**3.566**	**4.138**	**2.778**	*EU*
EU	4.012	4.212	**4.814**	**4.114**	**4.284**	**4.775**	**3.671**	**4.282**	**2.736**	*FRANCE*
FRANCE	4.201	4.177	4.417	**4.229**	**3.658**	**4.111**	**3.178**	**3.725**	**2.831**	*GERMANY*
GERMANY	3.899	4.014	3.969	4.281	**4.297**	**4.320**	**3.353**	**3.853**	**2.342**	*ITALY*
ITALY	3.857	3.747	3.844	3.556	3.884	**5.220**	**3.667**	**4.390**	**2.917**	*NETH.*
NETH.	4.212	4.052	4.171	3.885	3.756	4.494	**3.521**	**3.426**	**2.215**	*SWITH.*
SWITH.	3.532	3.401	3.497	3.289	3.098	3.397	3.496	**4.240**	**2.478**	*UK*
UK	3.973	3.753	3.874	3.668	3.432	3.894	3.312	4.240	**5.036**	US
US	3.748	3.790	3.898	3.588	3.531	3.774	3.274	3.562	4.402	

Table 5:
Results of Forbes and Rigobon test (p-values):Pre-crisis period (29th July 2004 to 16th July 2007), Crisis period (17th July 2007 to 20th March 2009), Total period (29th July 2004 to 20th March 2009).

Contagion to	Contagion from			
	US		UK	
	CP	4^{pm}	CP	4^{pm}
AUSTRIA	-0.325	0.731	-1.564	-1.676
	(0.627)	(0.767)	(0.941)	(0.953)
EU	-1.625	-2.530	-2.628	-2.517
	(0.948)	(0.994)	(0.996)	(0.994)
FRANCE	0.050	-0.449	-0.987	-1.049
	(0.480)	(0.673)	(0.838)	(0.853)
GERMAN	-0.200	0.387	0.792	0.185
	(0.579)	(0.349)	(0.214)	(0.427)
ITALY	-0.184	-0.778	-1.323	-1.189
	(0.573)	(0.767)	(0.907)	(0.883)
NETH.	-0.583	-0.778	-1.218	-1.306
	(0.720)	(0.782)	(0.888)	(0.904)
SWITH.	-0.229	-0.978	-1.403	-1.536
	(0.618)	(0.835)	(0.920)	(0.938)
UK	-0.766	-1.288	-	-
	(0.778)	(0.901)	-	-
US	-	-	-0.713	-1.254
	-	-	(0.762)	(0.895)

Table 6:
Results of Hong test for US (p-values)

Country	Pre-Crisis Period				Crisis Period			
	US$\nrightarrow R_{it}$		$R_{it} \nrightarrow US$		US$\nrightarrow R_{it}$		$R_{it} \nrightarrow US$	
	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}
AUSTRIA	0.787	0.864	0.911	0.849	**0.000**	0.871	0.656	0.737
EU	0.808	0.797	0.936	0.756	**0.000**	0.872	0.842	0.620
FRANCE	0.916	0.886	0.934	0.670	**0.000**	0.849	0.799	0.670
GERMANY	0.939	0.575	0.915	0.519	**0.000**	0.890	0.893	0.309
ITALY	0.927	0.906	0.277	0.391	**0.000**	0.812	0.708	0.708
NETH.	0.178	0.811	0.924	0.853	**0.000**	0.760	0.776	**0.077**
SWITH.	0.867	0.866	0.214	0.452	**0.000**	0.673	0.413	0.537
UK	0.629	0.814	0.147	0.659	**0.000**	0.798	0.712	0.842

Table 7:
Results of Hong test for UK (p-values)

Country	Pre-Crisis Period				Crisis Period			
	$UK \nrightarrow R_{it}$		$R_{it} \nrightarrow UK$		$UK \nrightarrow R_{it}$		$R_{it} \nrightarrow UK$	
	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}	CP	4^{pm}
AUSTRIA	**0.098**	0.457	0.872	0.775	0.584	0.686	0.600	0.920
EU	**0.084**	0.168	0.780	0.864	**0.001**	**0.000**	0.762	0.891
FRANCE	0.200	**0.000**	0.844	0.827	**0.014**	**0.000**	0.575	0.944
GERMANY	0.105	0.485	0.469	0.821	**0.049**	**0.020**	0.888	0.916
ITALY	0.131	**0.098**	0.128	0.123	**0.020**	**0.090**	0.488	0.847
NETH.	**0.040**	0.174	0.591	0.744	0.296	0.469	0.421	0.854
SWITH.	**0.087**	0.237	0.860	0.807	0.791	0.365	0.773	0.794

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