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On the role of stock market for real economic activity: Evidence for Europe[§]

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Abstract

In this study we have addressed the relationship between the stock market, the measure of real economic activity (represented by the real GDP), the economic sentiment indicator, and real interest rate for the five European countries: Germany, France, Italy, the Netherlands, and the UK. We find that even when accounting for expectations, represented by the economic sentiment indicator, the stock market has certain predictive content for the real economic activity. At the same time, the relationship between the economic sentiment indicator and the real activity seems to be more articulated than that between the latter variable and the stock market. We also have shown that the developments in the national stock markets are explained by the common factor shared by all of them. The greater relative importance of the economic sentiment indicator for the real GDP when compared to that of the stock market can be traced to the fact that the real economic activity is still shaped more by the domestic shocks rather than the global ones, i.e. those reflected in the stock market.

Keywords: Stock market, Real Activity, Economic Sentiment Indicator

JEL code: E44, G15.

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1 Introduction.

The relation between the stock market returns and the real economic activity has attracted a considerable attention both in the theoretical and empirical economic as well as financial literature. In particular, the literature identifies several channels via which movements in the stock market prices exert their influence on the real economy. The first one constitutes the consumption channel via the conventional wealth effect (Poterba, 2000). The second one relates to investment channel (Tobin, 1969), and the third one is related to the balance-sheet effect (Bernanke et al., 1998). At the same time, according to the discounted-cash-flow valuation model the stock market prices may work as a leading indicator that reflects investors expectations on the future economic prospects of a given country. Similarly, this indirect influence of the stock market for the real economy may work through consumer sentiments, which in turn are likely to be correlated with real consumption (Carroll et al., 1994).

Much of the related research that addresses the empirical link between the stock market prices and the real economy, which is measured either by the real industrial production or the real GDP, has been done focusing either only on the US economy (e.g. Fama, 1981, 1990; Schwert, 1990; Lee, 1992) or on a group of several countries such as the studies of Asprem (1989) with the focus on the ten European countries, Wasserfallen (1989) – on Germany, Switzerland, and the UK, Peiro (1996) – on Germany, France, the UK, and the US, Choi, Hauser, and Kopecky (1999) and Binswanger (2001) – on the G-7 countries (Canada, France, Germany, Italy, Japan, the UK, and the US), etc. Typically, these studies that have investigated interrelationship between the stock market and the real economic activity followed the path that have addressed this link only for a single country, i.e. in their models only the country-specific variables were allowed. It may be perfectly alright when one focuses on the US economy whose stock market plays an important, if not, the leading role in the global stock market development. But it may be problematic when one considers a sample of the European countries whose financial markets are partly affected by the US stock market and in addition they are very closely integrated. Therefore the developments in each separate country are shaped to a much greater degree by regional (and possibly, global) rather than by domestic shocks. This has to be contrasted with much more heterogenous developments in the country-specific measures of real economic activity, which is shaped both by the factors that are common to all countries as well as by the domestic factors that reflect the specificity of each country (e.g. institutional arrangements, economic structure, etc.).

This would imply that the strength of the link between the stock market performance and the stance of the real economic activity is expected to vary from country to country. In addition, in such situation, to the extent the stock market prices reflect the investors expectations on the future prospects of the economy as implied by the discounted-cash-flow valuation model, the investors

expectations regarding the regional development rather then the development in each particular country are much better represented. Hence, the motivation for investigating the link between stock prices and measures of real activity without taking into account the close integrity and cohesion of the national stock markets in European region seems to be flawed as the domestic sentiments on the future prospects of the economy tend to be underrepresented and/or overlooked in these empirical models.

In this study we attempt to overcome this problematic issue by examining the relation between stock prices and measures of real activity by conditioning on the Economic Sentiment Indicator (ESI) variable that is intended to reflect and represent the stance of the economic activity in each European country and it combines the forward-looking judgement and attitudes of both domestic producers and consumers. More precisely, it is a composite indicator that is constructed as weighted average of five confidence indicators calculated for industry, service, consumer, construction, and retail trade sectors (European Commission, 2004). Then, ability of the stock market to influence the real activity beyond that provided by the sentiment indicator would reflect either the causal influence of stock prices or it also may indicate that stock market prices better reflect expectations rather than economic sentiment indicator.

In order to illustrate our point, we proceed in two main steps. In the first step, we employ the principal components analysis in order to investigate the degree of cohesion between the developments in the local stock markets, in the level of economic activity, and in the economic sentiments of the public. In doing so, we intend to show that the variable reflecting local economic sentiments plays non-trivial role in relationship to the measure of economic activity and therefore it should not be neglected. In the second step, we employ the standard VAR methodology in order to investigate the relationship between the stock market prices and the real GDP while controlling not only for the real interest rate effects but also for the domestic sentiments.

The rest of the paper has the following structure. Section 2 describes the data used and their sources. Section 3 presents the econometric methodology and the specification procedure for the VAR models. The following section describes the obtained results and the final section concludes.

2 Data

In this paper we employ data for the following countries: France, Germany, Italy, the Netherlands, and the United Kingdom (UK). We use the share performance index (SPERI) supplied by Morgan Stanley Capital International (MSCI), Inc. The MSCI Total Return Index is a total stock market return index that includes reinvestment of dividends. Quarterly data are averages of monthly data reported on the last business day of the month. The share performance index has been deflated by the GDP price deflator of a corresponding country. We use the real GDP as the

measures of real economic activity.[1] The real GDP has been taken from the Eurostat database. The interest rate is the long-term government bond yield taken from the International Financial Statistics, IMF. Following Gordon and Veitch (1986), we have calculated the real interest rate (RE) as the nominal interest rate minus expected inflation approximated by a four-quarter 'rectangular' weighted average of past inflation. The economic sentiment indicator (ESI) has been provided by the European Commission. We employ the following sample size 1985:Q1 – 2004:Q4. Its starting date has been dictated by the availability of the ESI variable. Also all variables have been log transformed except the real interest rate and the economic sentiment indicator.

In order to determine the integration properties of the variables under consideration we have conducted the Augmented Dickey-Fuller unit root test. In the auxiliary test regressions we have allowed both for an intercept and a linear trend for those variables (the log of the share performance index and the log of the real GDP) that exhibit trending behaviour in order to gain power against the trend-stationary alternative. For the remaining variables (the economic sentiment indicator) – we allowed only an intercept, and for the real interest rate – we conducted the unit root tests using both specifications with intercept only and with both an intercept and a linear trend. The lag length has been selected by the Modified Akaike Information Criterion for all test regressions. The critical values has been reported after MacKinnon (1991).

Table 1 displays the unit root test results. As seen, for the following variables: the log of the share performance index, the log of the real GDP, we cannot reject the null hypothesis of I(1). The real interest rate appear to be an I(1) variable for all countries except for Germany. At the same time, we can reject the null hypothesis that the economic sentiment indicator is I(1) at the 5% significance level for all countries except the for United Kingdom, where we can reject the null hypothesis only at the 10% significance level.

Consistent with the unit root test results, we have introduced the following shorthand abbreviations for the stationary transformation of the variables of our interest: $DLSPERI$ and $DLGDP$ - first difference of the logarithmic transformation of the real share performance index and the real GDP, respectively. DRE is the first difference of the real interest rate. As mentioned above, we label the economic sentiment indicator as ESI in our subsequent text.

3 Econometric methodology and VAR model specification

3.1 Principal Components Analysis

In this subsection we investigate the degree of cohesion between the national stock market returns using the correlation as well as the principal components analysis. We also apply these analysis

[1] We also conducted the same analysis with the real industrial production as the measure of economic activity. Since the obtained results were very similar we have opted to omit them in order to save space.

to the quarterly growth rates of the real GDP as well as to the Economic Sentiment Indicator. The results are reported in Table 2. The upper panel reports the correlation matrix between the national variables, whereas the lower panel reports the correlation coefficient between each of the national variables and the extracted common factor as well as the share (in per cent) of the total variation accounted by the first principal component. The results suggest that indeed the stock market returns exhibit the highest degree of cohesion, which implies that a common factor plays a dominant role in their development. On the contrary, there is rather large degree of heterogeneity displayed by the measure of economic activity. The Economic Sentiment Indicator takes a place somewhat in between these two extremes, which reflects the fact that it is both being shaped by the international and national factors.

3.2 Econometric methodology

In this subsection we describe the empirical approach using the VAR modelling framework. First of all, given the results of the unit root tests, as described in the previous section, we conclude that we have unbalanced set of regressors with respect to their integration properties. That is, such variables as the log of the real share performance index, the log of the real GDP, and the real interest rate can be described as I(1) variables, whereas the economic sentiment indicator - as I(0) variable. Furthermore, Choi et al. (1999) and Binswanger (2001) report the controversial findings with respect to existence of cointegration between the stock prices and the real GDP, respectively. Given these two facts in mind, we have opted not to consider cointegrated system mainly due to the latter finding as the evidence for existence of cointegration between these two key variables seems to be at best very fragile, which would jeopardise also the results that are based on such a weak relation.[2]

In the following, we specify the VAR model for each country using either the stationary (first-difference) transformation of the variable found to be I(1) or the I(0) variables themselves. Since we deal with the stationary variables, we can employ the well-understood methods for investigating the causal links and dynamic interactions between the variables of interest such as Granger causality tests, Generalised Impulse Response Functions, and Generalised Forecast Error Variance Decompositions suggested in Pesaran and Shin (1998). While each of these three methods focuses on a particular aspect of an interdependence between the variables of interest, taken as a package they naturally complement each other. The Granger causality tests determine the predictive content of one variable beyond that inherent in the explanatory variable himself. The Granger causality test uses information that is present only in one equation and therefore its results can be interpreted

[2]Before specifying the VAR models using only stationary variables, we have checked for the presence of cointegration among the I(1) variables. The cointegration tests deliver no firm evidence of existence of cointegration between the I(1) variables under consideration for all countries. Our conclusions on the absence of cointegration among these variables are further reinforced by the contradicting findings reported in Choi et al. (1999) and Binswanger (2001).

as the short-run influence of one variable on the other. On the opposite, the impulse response functions and forecast error variance decompositions utilise the whole system information. The former method investigates the extent to which a shock that hits one variable influences the other variables. The latter method is used in order to determine the effect of unanticipated shock to one variable for other variables in the system over time, or more precisely, it is used in order to measure the contribution of one variable on the $h-$step ahead forecast error variance for the rest of the variables. Observe that instead of using the traditional orthogonalised impulse response functions and the othogonalised forecast error variance decompositions, that have a well-known shortcoming of being sensitive to the variable ordering in a VAR model, we use their generalised counterparts derived in Pesaran and Shin (1998). As shown in Pesaran and Shin (1998), the generalised impulse response functions and the generalised forecast error variance decompositions are invariant to the variable ordering in a VAR model. The results of both methods coincide if the residual covariance matrix of a VAR model is diagonal.

3.3 VAR model specification

Since the VAR model is the horseback of our analysis, it is important to select an adequate VAR model that meets all the model specification issues as close as possible. In selecting the appropriate VAR model for each country we have tried to balance between the following two extremes. On the one hand, given not so long sample period we have tried to limit the lag length of each VAR model that we estimate for each individual country, in order to avoid parameter inference problems caused by model over-fitting. On the other hand, setting too small lag length of the VAR models would result in violation of the model design criteria, implying a possible model misspecification.

Thus, in choosing an appropriate lag length of the VAR models we have employed the following lag length selection criteria: the sequential modified likelihood ratio (LR) test, discussed in Lütkepohl (1991), the Akaike Information Criterion (AIC), the Final Prediction Error (FPE), the Hannan-Quinn Information Criterion (HQ), and the Bayesian Information Criterion (BIC). Our strategy is to select the most parsimonious model subject to the requirement that is meets the following design criteria: the multivariate Langrange Multiplier test of no residual autocorrelation of order from one to five, the multivariate Doornik and Hansen (1994) test of residual normality, and the multivariate heteroscedasticity test of White (1980).

4 VAR results

In this section we report the results of our empirical analysis. Tables 3 and 4 summarise results of the VAR lag selection procedure for the real GDP. As seen, the selected order of lag augmentation

is consistent with the penalty strength that each information criterion imposes. The BIC and HQ tend to select a more parsimonious model than one selected by FPE and AIC. Depending on the criterion the VAR lag length is selected either 3 or 2 for Germany and either 2 or 1 for the rest of the countries. Table 4 indicates the selected lag length for each VAR model with the appropriate design criteria fulfilled.

Table 5 reports the results of the Granger causality tests. As seen, the results of these tests vary from country to country. We find rather weak evidence that the stock market returns Granger cause the real activity, as only for France we can decisively reject the null hypothesis of no Granger causality and for the Netherlands we can reject the null hypothesis of no Granger causality only at the 10% significance level. On the contrary, we see that the lags of the ESI variable appear to be informative for the contemporaneous values of the growth rates of the GDP for all countries but for France. The real interest rate was found not to Granger cause real activity for all countries.

Observe that the ESI variable seems to be Granger caused either by one or several variables depending on the country. We also find that the other variables have a limited predictive contents for the real stock market returns as well as for the real interest rates.

The results of the generalised IRF are reported in Figures 1 – 5. These figures display the impulse response functions for the growth rates of the real GDP for each country. As seen, the conclusions obtained from the Granger causality analysis hold in general. The real GDP reacts positively to the innovations both in the stock market returns and the economic sentiments. However, for the latter variable the obtained results are more clearcut from the statistical point of view as the calculated 95% confidence bands tend to be smaller than for the latter variable.

Table 6 displays the results of the generalised forecast error variance decomposition. Again, the results are largely support the conclusions reached on the basis of the Granger causality tests and the impulse response functions. The major part of the forecast error variance in $DLSPERI$ and $(D)RE$ can be attributed to their own innovations, respectively. Moreover, the innovations of $(D)RE$ tend to contribute the relatively minor part to the forecast error variance for all variables. At the same time, the ESI variable seems to be influenced to a relatively large extent both by the $DLSPERI$ and $DLGDP$ variables. Furthermore, the comparison of the relative contributions of the $DLSPERI$ and ESI variable innovations to the forecast error variance of $DLGDP$ reveals that for all countries the contribution of the former variable is much smaller than that of the latter.

5 Conclusion

In this study we have addressed the relationship between the stock market and the real economic activity, represented by the real Gross Domestic Product, for the five European countries: Germany, France, Italy, the Netherlands, and the UK. In addition to the variables, that are commonly used

in such an analysis, like the stock market returns, the measures of real economic activity, and the interest rate we have included the composite leading indicator in our empirical VAR models. The composite leading indicator (Economic Sentiment Indicator) is constructed by the European Commission for practically all countries of the European Union and it is intended to reflect the judgement and expectations of both business and consumers on the current and future economic stance of the corresponding countries. Adding this expectations indicator can be justified on the following grounds. When considering the interrelationship between the development in the national stock markets and the real activity, it is necessary to take into account the fact that the national stock markets of the European countries under consideration are closely integrated. In this case, the developments in the national stock markets is likely to be dominated by the area-wide factor rather than by the purely domestic ones. This also would imply that these studies that have not addressed this issue are likely to be flawed as the domestic factors that influence the development of the economy at the national level (e.g. through the domestic expectations on the future economic prospects) are likely to be underrepresented. We have tried to overcome this shortcoming by including the Economic Sentiment Indicator, as mentioned above.

Our finding is that the stock market exerts a rather weak influence on the real activity that is barely statistically detectible in our sample. Nevertheless, the evidence from the generalised impulse response functions indicates that the real activity positively reacts to the positive shocks in the stock market, albeit the associated confidence bands tend to be quite large. At the same time, we find that the interrelation between the economic sentiment indicator and the growth rates of the measures of real activity seems to be stronger than that between the stock market returns and the growth rates of the real GDP.

This implies that the impact of the country-specific factors that influence the national stock markets are of much smaller magnitude than those shocks that shape the trends in the regional or even global stock market developments. In this respect, one possible explanation of our earlier conclusion on the stronger interconnection of the economic sentiment indicator and the measures of real economic activity relative to that measured for the stock market returns could be following. In contrast to the economic sentiment indicators that largely reflect domestic expectations, the stock market is much more influenced by the global market forces. The real activity is also shaped by these two types of factors: domestic as well as global ones. Hence our result on the relative importance of the economic sentiment indicator relative to that displayed by the stock prices may indicate that domestic factors still play a major role in shaping the real economic activity at least in the those countries we have looked at.

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Table 1: ADF unit root test results

		lag	t-Statistic	p-value
France	Share performance index	1	-1.61	0.47
	Interest rate with expected inflation	4	-1.09	0.72
	Interest rate with expected inflation*	4	-2.56	0.30
	Economic Sentiment Indicator	1	-3.33	0.02
	Real GDP	2	-1.09	0.72
Germany	Share performance index	1	-1.47	0.54
	Interest rate with expected inflation	3	-3.88	0.00
	Interest rate with expected inflation*	3	-4.09	0.01
	Economic Sentiment Indicator	1	-3.26	0.02
	Real GDP	2	-1.30	0.63
Italy	Share performance index	3	-1.83	0.36
	Interest rate with expected inflation	4	-1.08	0.72
	Interest rate with expected inflation*	4	-1.47	0.83
	Economic Sentiment Indicator	1	-3.25	0.02
	Real GDP	4	-1.99	0.29
Netherlands	Share performance index	0	-1.55	0.50
	Interest rate with expected inflation	5	-0.24	0.93
	Interest rate with expected inflation*	4	-3.03	0.13
	Economic Sentiment Indicator	2	-3.11	0.03
	Real GDP	1	-0.87	0.79
United Kingdom	Share performance index	0	-1.77	0.39
	Interest rate with expected inflation	1	-2.39	0.15
	Interest rate with expected inflation*	1	-2.83	0.19
	Economic Sentiment Indicator	1	-2.71	0.08
	Real GDP	2	-2.14	0.23

Notes: * – with an intercept and a linear trend

Table 2: Correlation and Principal Components Analysis

Correlation matrix

DE_DLSPERI	1.00				
FR_DLSPERI	0.81	1.00			
IT_DLSPERI	0.71	0.75	1.00		
NL_DLSPERI	0.82	0.81	0.61	1.00	
UK_DLSPERI	0.67	0.75	0.59	0.83	1.00
DLDE_GDP	1.00				
DLFR_GDP	0.42	1.00			
DLIT_GDP	0.25	0.52	1.00		
DLNL_GDP	0.42	0.40	0.18	1.00	
DLUK_GDP	0.00	0.17	0.23	0.07	1.00
DE_ESI	1.00				
FR_ESI	0.60	1.00			
IT_ESI	0.60	0.85	1.00		
NL_ESI	0.65	0.70	0.72	1.00	
UK_ESI	0.16	0.34	0.52	0.29	1.00

	DE	FR	IT	NL	UK	Variation
DLSPERI	0.90	0.93	0.82	0.92	0.87	78.85
DLGDP	0.69	0.83	0.68	0.66	0.29	43.17
ESI	0.77	0.89	0.93	0.86	0.51	65.13

Table 3: VAR lag length selection criteria

	Lag	LogL	LR	FPE	AIC	BIC	HQ
	0	-688.653	NA	3179.601	19.415	20.043	19.665
	1	-516.170	302.436	43.881	15.128	16.258	15.578
	2	-469.487	76.739	19.128	14.287	**15.919**	**14.938**
DE	3	-450.641	**28.914**	**18.041**	**14.209**	16.343	15.060
	4	-438.695	17.020	20.816	14.320	16.956	15.371
	0	-603.579	NA	248.103	16.865	17.242	17.015
	1	-502.682	182.444	24.290	14.539	**15.418**	**14.889**
	2	-484.439	**30.988**	**23.001**	**14.478**	15.858	15.028
FR	3	-476.376	12.812	29.005	14.695	16.578	15.445
	4	-461.660	21.772	30.813	14.730	17.115	15.681
	0	-681.161	NA	1669.085	18.772	18.897	18.822
	1	-588.581	172.477	**204.959**	**16.673**	**17.301**	**16.924**
	2	-573.503	**26.439**	211.080	16.699	17.828	17.149
IT	3	-563.420	16.574	250.804	16.861	18.492	17.511
	4	-551.107	18.891	282.917	16.962	19.095	17.812
	0	-613.480	NA	363.206	17.246	17.748	17.446
	1	-502.619	197.424	27.089	14.647	**15.651**	**15.047**
	2	-481.333	**35.574**	**23.637**	**14.502**	16.008	15.102
NL	3	-468.444	20.128	26.178	14.588	16.596	15.388
	4	-453.266	22.040	27.549	14.610	17.120	15.610
	0	-586.694	NA	194.628	16.622	17.249	16.872
	1	-487.064	174.693	19.768	14.331	**15.460**	14.781
	2	-461.228	**42.471**	**15.255**	**14.061**	15.693	**14.711**
UK	3	-454.069	10.983	19.818	14.303	16.437	15.154
	4	-442.851	15.982	23.327	14.434	17.070	15.485

Table 4: VAR design criteria

	DE	FR	IT	NL	UK
Lag order	2	2	2	1	2
F_{AR}(1-5)	[0.3107]	[0.4459]	[0.2751]	[0.0805]	[0.3292]
χ^2_{Norm}	[0.7193]	[0.8653]	[0.1064]	[0.1645]	[0.8433]
F_{Hetero}	[0.9998]	[0.8550]	[0.9964]	[0.7855]	[0.9961]

Table 5: Granger causality test results

	DE	FR	IT	NL	UK
	Dependent variable: DLSPERI				
Exclude					
ESI	0.521	0.045	0.115	0.202	0.046
DLGDP	0.092	0.079	0.484	0.355	0.119
(D)RE*	0.879	0.162	0.585	0.582	0.058
All	0.278	0.067	0.232	0.562	0.054
	Dependent variable: ESI				
DLSPERI	0.498	0.709	0.509	0.000	0.156
DLGDP	0.706	0.138	0.001	0.005	0.003
(D)RE*	0.004	0.393	0.374	0.057	0.098
All	0.041	0.236	0.005	0.000	0.002
	Dependent variable: DLGDP				
DLSPERI	0.653	0.003	0.578	0.055	0.253
ESI	0.021	0.280	0.013	0.003	0.044
(D)RE*	0.247	0.223	0.852	0.243	0.785
All	0.001	0.010	0.096	0.005	0.087
	Dependent variable: (D)RE*				
DLSPERI	0.104	0.341	0.032	0.043	0.609
ESI	0.050	0.929	0.056	0.107	0.017
DLGDP	0.719	0.360	0.174	0.890	0.101
All	0.064	0.725	0.032	0.075	0.099

*Notes:** – RE for Germany
DRE – for the rest of the countries

Table 6: Generalised Forecast Error Variance Decomposition

	DE				FR				IT				NL				UK			
	Equation for DLSPERI				Equation for DLSPERI				Equation for DLSPERI				Equation for LSPERI				Equation for DLSPERI			
h	DLSPERI	ESI	DLGDP	RE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE
1	1.000	0.065	0.023	0.010	1.000	0.004	0.000	0.035	1.000	0.044	0.012	0.025	1.000	0.030	0.044	0.003	1.000	0.084	0.010	0.136
4	0.937	0.093	0.077	0.010	0.886	0.011	0.032	0.083	0.907	0.073	0.046	0.031	0.982	0.032	0.058	0.006	0.888	0.100	0.033	0.149
8	0.923	0.103	0.081	0.014	0.862	0.031	0.043	0.086	0.876	0.097	0.066	0.032	0.978	0.035	0.058	0.007	0.879	0.104	0.042	0.148
12	0.917	0.109	0.082	0.014	0.858	0.032	0.046	0.087	0.873	0.099	0.067	0.032	0.977	0.036	0.059	0.007	0.877	0.105	0.043	0.147
	Equation for ESI				Equation for ESI				Equation for ESI				Equation for ESI				Equation for ESI			
h	DLSPERI	ESI	DLGDP	RE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE
1	0.065	1.000	0.229	0.064	0.004	1.000	0.305	0.001	0.044	1.000	0.117	0.006	0.030	1.000	0.005	0.001	0.084	1.000	0.071	0.000
4	0.134	0.934	0.208	0.202	0.028	0.888	0.520	0.035	0.070	0.853	0.422	0.004	0.282	0.732	0.145	0.077	0.099	0.782	0.351	0.034
8	0.145	0.916	0.173	0.151	0.040	0.781	0.550	0.092	0.071	0.829	0.449	0.006	0.327	0.673	0.161	0.102	0.122	0.666	0.473	0.028
12	0.127	0.801	0.153	0.240	0.040	0.773	0.549	0.097	0.071	0.827	0.449	0.006	0.337	0.659	0.165	0.108	0.127	0.654	0.482	0.027
	Equation for DLGDP				Equation for DLGDP				Equation for DLGDP				Equation for DLGDP				Equation for DLGDP			
h	DLSPERI	ESI	DLGDP	RE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE
1	0.023	0.229	1.000	0.071	0.000	0.305	1.000	0.014	0.012	0.117	1.000	0.004	0.044	0.005	1.000	0.022	0.010	0.071	1.000	0.003
4	0.045	0.228	0.868	0.098	0.091	0.309	0.849	0.059	0.037	0.216	0.873	0.008	0.073	0.032	0.926	0.036	0.065	0.192	0.895	0.005
8	0.044	0.232	0.852	0.102	0.092	0.305	0.835	0.072	0.037	0.217	0.871	0.009	0.080	0.042	0.912	0.038	0.073	0.201	0.885	0.007
12	0.044	0.232	0.841	0.114	0.092	0.305	0.835	0.072	0.037	0.217	0.870	0.009	0.082	0.045	0.907	0.039	0.074	0.201	0.884	0.007
	Equation for RE				Equation for DRE				Equation for DRE				Equation for DRE				Equation for DRE			
h	DLSPERI	ESI	DLGDP	RE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE	DLSPERI	ESI	DLGDP	DRE
1	0.010	0.064	0.071	1.000	0.035	0.001	0.014	1.000	0.025	0.006	0.004	1.000	0.003	0.001	0.022	1.000	0.136	0.000	0.003	1.000
4	0.044	0.211	0.118	0.935	0.027	0.006	0.036	0.973	0.084	0.090	0.037	0.855	0.037	0.012	0.029	0.958	0.113	0.012	0.058	0.908
8	0.056	0.386	0.135	0.774	0.028	0.006	0.036	0.971	0.097	0.100	0.041	0.832	0.047	0.038	0.034	0.925	0.111	0.036	0.087	0.868
12	0.059	0.398	0.125	0.725	0.028	0.006	0.036	0.971	0.097	0.101	0.041	0.831	0.055	0.049	0.037	0.908	0.112	0.040	0.092	0.860

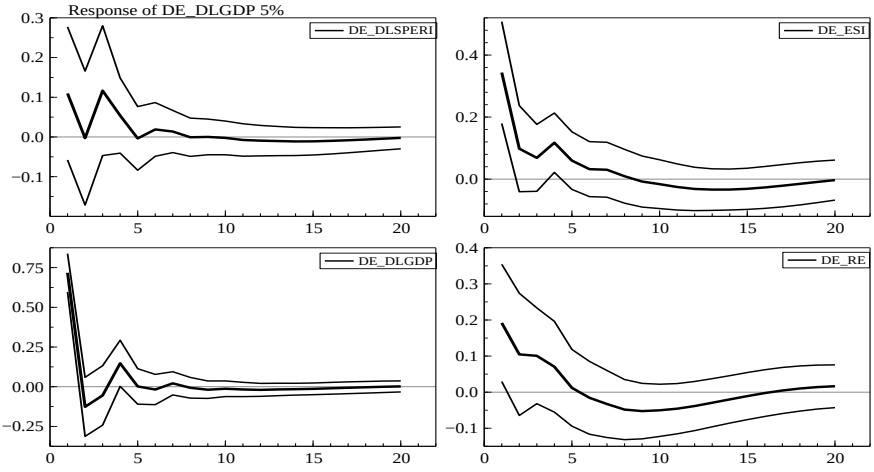

Figure 1: DE: Generalised Impulse Response Function for DLGDP along with the 95% confidence band

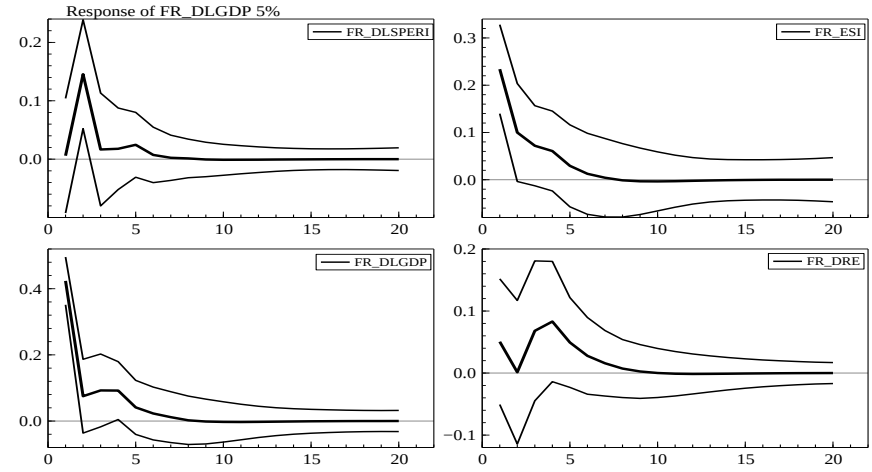

Figure 2: FR: Generalised Impulse Response Function for DLGDP along with the 95% confidence band

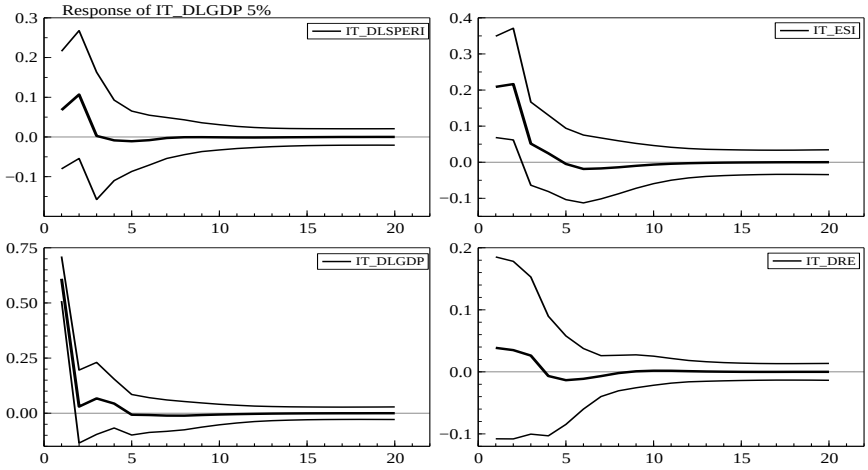

Figure 3: IT: Generalised Impulse Response Function for DLGDP along with the 95% confidence band

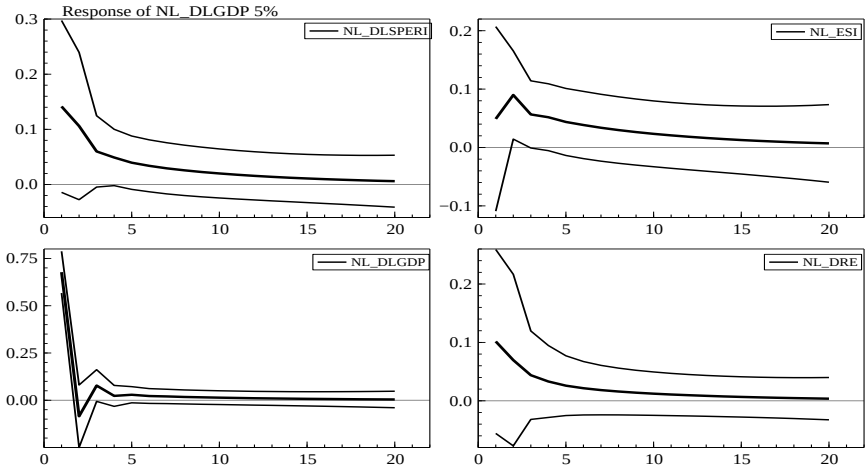

Figure 4: NL: Generalised Impulse Response Function for DLGDP along with the 95% confidence band

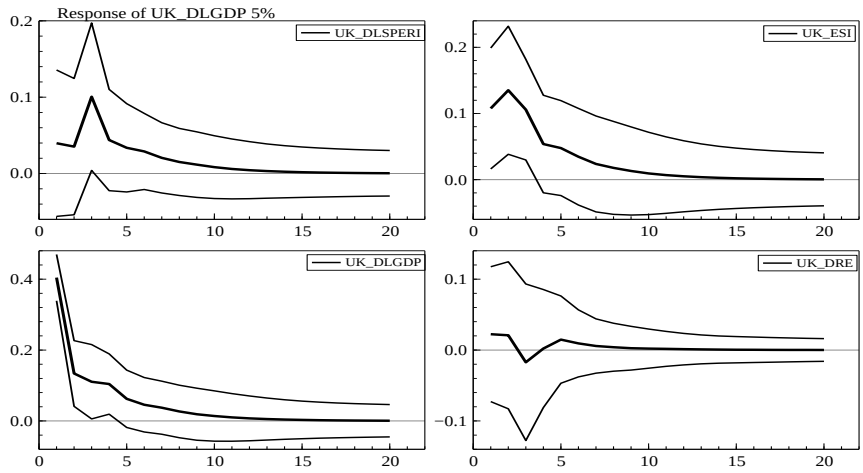

Figure 5: UK: Generalised Impulse Response Function for DLGDP along with the 95% confidence band