Cyprus Economic Policy Review, Vol. 8, No. 2, p.p. 87-106 (2014) 1450-4561

Uncertainty Shocks in Eurozone Periphery Countries and Germany†

Panagiotis E. Petrakis*, Dionysis G. Valsamis and Pantelis C. Kostis

Department of Economics, University of Athens

Abstract

High levels of uncertainty regarding macroeconomic aggregates indicate that the overall efficient functioning of economies is worsening. This paper examines the extent to which uncertainties lurking in the formulation of economic policy and the decisions made by policy makers are major constraints to Eurozone periphery countries (Portugal, Italy, Greece and Spain). An Uncertainty Index is constructed based on the volatility of the stock market, from the euro's adoption in January 2001 up to December 2013. We conduct a VAR analysis and examine the impulse responses of an uncertainty shock of 2% and conclude that the shock significantly affects manufacturing production. Such an uncertainty shock dissipates after 5 months for Portugal, 7 months for Spain, 8 months for Germany, 10 months for Greece, and 13 months for Italy.

Keywords: Uncertainty index, uncertainty shock, production, VAR, impulse responses, Eurozone periphery.

1. Introduction

Uncertainty regarding macroeconomic aggregates indicates that the overall efficient functioning of markets is worsening. The impact of uncertainty on economic activity varies, with the main consequence being shaping behaviors and actions that deviate from rationality and the maximization of wealth and prosperity. The strong presence of uncertainty, risk, and turbulence all affect the development of modern production models.

Uncertainty has a vital role in the evolution of business cycles. For example, uncertainties facing companies waiting for the right time to invest or engage in recruitment during the current financial crisis, the economy generates recessions. In addition: a) the cost of capital increases; b) risk aversion grows; and c) companies and households are possessed by uncertainty about future taxes, spending levels, regulatory measures, reforms, and interest rates. Subsequently, there is a delay in investments,

† The paper is funded by the Research Fund of the Economic Department of the National and Kapodistrian University of Athens.

* Corresponding Author. Address Department of Economics, University of Athens, 5 Stadiou Street, PC 105 62, Athens, Greece, Email: ppetrak@econ.uoa.gr.

the consumption of goods, and the hiring of employees that prevents recovery.

The scope of the paper is to examine the extent to which uncertainty is a major constraint to the effective functioning of the Eurozone periphery countries—also known as PIGS (Portugal, Italy, Greece and Spain)—particularly subsequent to the Great Recession of 2008. The goal is to create an index expressing economic uncertainty by examining its evolution from the adoption of the euro common currency until today (2013) for the PIGS countries and Germany. Additionally, the article considers the impact of an uncertainty shock on the production function of these economies in the coming 24 months after the negative event. In order to identify this impact we use the model of impulse responses.

The paper contributes to the debate on whether uncertainty affects financial results based on the creation of an uncertainty index for the PIGS countries and Germany. The index is expected to be a useful and reliable tool for examining the role of uncertainty in economic activity and to lead to safer estimations for the future development of economic aggregates. Additionally, it is expected to provide guidance to policymakers on economic policy, as it will establish whether the stabilization, the levels, and the volatility of macroeconomic aggregates would result in prosperity benefits.

The paper proceeds as follows: Section 2 presents the theoretical work on uncertainty measurements and uncertainty shocks. Section 3 describes the data used and Section 4 the methodology employed. Section 5 presents the empirical measurements and a discussion of the results. Finally, Section 6 presents the conclusions.

2. Literature Review

The economic impact sequence is almost identical in all financial crises (Furceri and Mourougane, 2009). In common with previous experiences, uncertainty has been the defining feature of the current financial crisis. When a financial crisis emerges, it results in reduced demand for goods and reduced incentives for capital investment while generating increased uncertainties and risks. The existence of high uncertainty has been connected with sluggish economic recovery escalating the financial stress in the Eurozone. The basic questions relating to uncertainty relate to: (a) its measurement; (b) its evolution over the business cycle; and (c) its impact on economic activity.

Many recent studies (Bonn and Pfeifer 2011; Fernandez-Villaverde et al. 2011; Pastor and Veronesi 2011a, 2011b) examine the impact of uncertainty

caused by political factors on economic outcome. The surge of uncertainty, from certain political or economic shocks, can have a direct, powerful and long-lasting impact on the economy (Alexopoulos and Cohen 2008; Baker et al. 2011). Production, employment, productivity, and investment fall in response to an unexpected increase in uncertainty.

Investment is significantly affected by the existence of the uncertainties taken into account during enterprise decision making (Dixit and Pindyck 1994; Durnev 2010; Bhagat and Obreja 2011; Chen et al. 2011), both in the short and long run (Driver and Moreton 1991). Belke and Goecke (2005) and Bloom (2009) believe that the suspension of decisions on investment and employment because of uncertainty may lead to economic recession.

Bloom et al. (2011) determine that uncertainty has a crucial impact on the United States (US) economy. An increase in policy uncertainty equal to the actual change between 2006 and 2011 foreshadows large and persistent declines in aggregate outcomes, with peak declines of 3.2% in real GDP. They also found that uncertainty has a counter-cyclical effect at industrial and aggregate levels, implying macro and micro uncertainty shocks in economic activity. In the case of the United Kingdom (UK), Denis and Kannan (2013) find that uncertainty shocks have a significant effect on economic activity, depressing industrial production and GDP by 0.6% and 0.3%, respectively.

In the literature there are some proxies that try to measure economic uncertainty. One of the most popular indexes is the VIX index that measures the risk aversion in financial markets and is calculated using the price of near-term options on S&P 500 index. Bloom (2009) based on VIX index constructed his own uncertainty index. The VIX index can be decomposed into a component that reflects actual expected stock market volatility (uncertainty) and a residual, the so-called variance premium, that reflects risk aversion and other non-linear pricing effects (Bekaert et al. 2013).

Macroeconomic uncertainty (measured by volatility of stock returns, productivity, dispersion in unemployment, or GDP forecasts) varies based on the phase of economic cycle: during expansionary periods in advanced economies the uncertainty level is lower than during recessionary periods (IMF 2012). Microeconomic uncertainty (measured as deviation of stock returns or firm sales) is also countercyclical.

Moreover, the existence of uncertainty may significantly affect the cost of consumption (Bernanke 1983; Romer 1990; Alexopoulos and Cohen 2009), or may drive employees to seek higher wages that if ultimately realized would have a negative impact on employment and, therefore, on investment and GDP (Blackburn and Pelloni 2005).

Sedative uncertainty effects may arise from other factors, such as increasing financing costs (Gilchrist et al. 2010; Fernandez-Villaverde et al. 2011; Pastor and Veronesi 2011a), increased risk aversion (Panousi and Papanikolaou 2011) and the intensification of the principal-agent problem (DeMarzo and Sannikov 2006; Narita 2011).

In contrast, Sandmo (1970) believed that increased uncertainty may accelerate the average growth because of an investment increase. Black (1987) argues that the average growth of real output can increase with increased uncertainty, since investors seek higher average yields as a result of the higher risk involved. Finally, there are some studies (Bachman et al. 2010; Bachman and Bayer 2011; Knotek and Khan 2011) that suggest that the impact of uncertainty on economic activity is not significant. For example, Chugh (2011) argues that a shock in firm-level productivity in the US manufacturing sector does not have a significant impact on GDP fluctuations. In the same line, from German firm data Bachmann and Bayer (2011) find that time-varying firm level risks alone does not have a significant effect on business cycles.

3. Data

The data used in our analysis relate to the Eurozone periphery countries with Germany being used as a contrast. The Eurozone periphery countries were chosen as this group of countries was most affected by the Great Recession, marking a significant exacerbation in macroeconomic aggregates.

The study timeframe is from January 2001 (when all countries under consideration adopted the euro) up to December of 2013, with a total of 154 observations for each variable used, for each country.

We use daily stock market data for the countries under analysis as well as data from some major world stock markets. Thus, daily market prices come from the FTSE/ATH Large Capitalization Index (Greece), the FTSE MIB Index (Italy), the IBEX 35 Index (Spain), the PSI 20 Index (Portugal), and the DAX Index (Germany). Major world stock indexes used are the Standard & Poor's 500 Index (US), the FTSE 100 Index (UK), the CAC 40 Index (France), the NIKKEI 25 Index (Japan) and the Hang Seng Index (China-Hong Kong). All data are obtained from the Reuters Datastream. These indexes represent -in a high degree- the movements of the main stock exchange indexes. This is due to the fact that these indexes represent the corporations with the largest capitalization, highly affecting the main stock exchange indexes.

We convert daily data from each index to monthly data and then calculate the Global Stock Market Index as a weighted average of each country's annual GDP (GDP at current prices) (Source: International Monetary Fund - World Economic Outlook Database).

European interest rates (Euribor 3 months), obtained from the European Central Bank, are also used.

Further, we use Harmonized Index of Consumer Prices (HICP) monthly data for each country (monthly rate of change, 2005 = 100). The data are obtained from the Eurostat database (prc_hicp_midx).

Finally, we use monthly industry production data, specifically the production in manufacturing sector (volume index of production, 2010 = 100), for each country. Production in manufacturing sector consists the more representative sector in economy following the business cycles. This index is encompassed in the analysis of many studies regarding the response of real economy to an uncertainty shock (i.e., Bloom 2009). The data are obtained from the Eurostat database (sts_inpr_m). Table 1 presents the descriptive statistics of the variables used.

4. Methodology

Baker et al. (2011) measure an uncertainty index based on (i) the frequency of references to economic uncertainty and policy in the Google news media catalog; (ii) the number of federal tax code provisions set to expire in future years; and (iii) the extent of disagreement among economic forecasters over future federal government purchases and the future CPI price level. However, our analysis suggests a different point of view, based on the volatility of the stock markets which is used to identify uncertainty shocks specific to each PIGS country and to Germany. The volatility of the stock markets incorporates the effects of the factors used by Baker et al. (2011).

As a proxy for global uncertainty, we create a Global Stock Market index based on the daily prices of major world stock markets (US, UK, France, Japan and China–Hong Kong). We convert the daily data of each index to monthly data and calculate the Global Stock Market Index.

TABLE 1
Descriptive statistics

	N	Median	Average	SD	Variance	Min	Max
Global Stock Market Index	154	98.53	107.67	51.75	2678.51	45.96	395.51
Euribor (3 months)	154	2.14	2.36	1.46	2.14	0.19	5.11
FTSE/ATH Large (Greece)	154	1,174.32	1,260.58	712.86	508,163.78	204.11	2,764.91
FTSE MIB (Italy)	154	26,156.73	26,928.20	8,543.07	72,984,085.87	13,327.94	43,911.93
IBEX 35 (Spain)	154	9,245.34	9,654.05	2,386.91	5,697,332.02	5,823.53	15,697.46
PSI 20 (Portugal)	154	7,499.37	7,776.95	2,062.52	4,253,969.56	4,569.13	13,506.04
DAX (Germany)	154	5,855.06	5,704.18	1,528.93	2,337,620.25	2,479.85	9,235.01
HICP (Greece)	154	106.17	106.42	12.01	144.35	84.75	124.09
HICP (Italy)	154	104.1	104.66	8.93	79.82	89	120.1
HICP (Spain)	154	106.35	105.36	10.62	112.81	86.34	121.74
HICP (Portugal)	154	105.75	104.06	8.45	71.47	87.49	117.13
HICP (Germany)	154	103.85	103.99	6.84	46.79	93	116.2
Production in Manufacturing (Greece)	154	112.12	110.82	17.09	292	75.51	141.34
Production in Manufacturing (Italy)	154	111.4	108.38	20.64	425.81	48.8	137.2
Production in Manufacturing (Spain)	154	114.4	112.16	18.59	345.73	67.64	143.59
Production in Manufacturing (Portugal)	154	108.25	108.79	13.77	189.48	77.32	136.37
Production in Manufacturing (Germany)	154	97.9	98.39	10.56	111.42	76.9	118.9

An overall uncertainty indicator is subsequently created for each country by computing a rolling-window 30-day standard deviation of the main stock index returns (taking each day into account the standard deviation of the previous 30 calendar days). To isolate country-specific shocks, we perform a regression on the monthly average of this uncertainty indicator on its global counterpart (Global Stock Market Index) and label the residual (normalized in order to present prices below or above 100) as a country-specific UI (European Commission 2012).

The monthly pattern of these indicators shows the economic UI evolution since 2001. The climate of uncertainty is heightened into sharp country-specific uncertainty shocks around the dates of major political and economic turbulences. Since the crisis onset, the Eurozone periphery economies have been hit by a series of uncertainty shocks.

The economic activity of the countries under consideration has been negatively affected by the heightened uncertainty about their economic and political developments. To gauge the effect of uncertainty on the aggregate activities we create a vector-autoregressive model (VAR) including the following variables for each economy: our UI, the major stock index of the economy, the European interest rates, the HICP level, and an industrial production (manufacturing) variable. We take logarithms of all variables except the European interest rates. The system is identified following the standard recursive ordering procedure in order of the listed variables. The appropriate VAR lag-length is chosen using the lag Schwarz information criterion. We vary both the lag length and the variable order to ensure result robustness.

Concerning the issue of stationarity for our time series in VAR model we used the Augmented Dickey Fuller (ADF) test (Said and Dickey 1984). The purpose of the test is to detect the existence or not of unit root in the time series. The results of the ADF test reveal that our time series are stationary. Having a stationary time series means that a VAR is expected to provide satisfactory results. Furthermore, all variables are Hodrick–Prescott (HP) detrended ($\lambda = 129{,}600$).

Using this model, we examine the impact of various events (uncertainty shocks) on the UI and the dynamic response of economic activity during uncertainty turbulence. An uncertainty shock is defined as a two percentage points shock. The VAR examines the extent to which the presence of economic and political uncertainty has a negative impact on industrial production.

5. Empirical Results and Discussion

This section examines the UI for each PIGS country using Germany as a benchmark: the higher the index value the higher the prevailing uncertainty in the economy, while the lower the index value the lower the prevailing uncertainty in the economy.

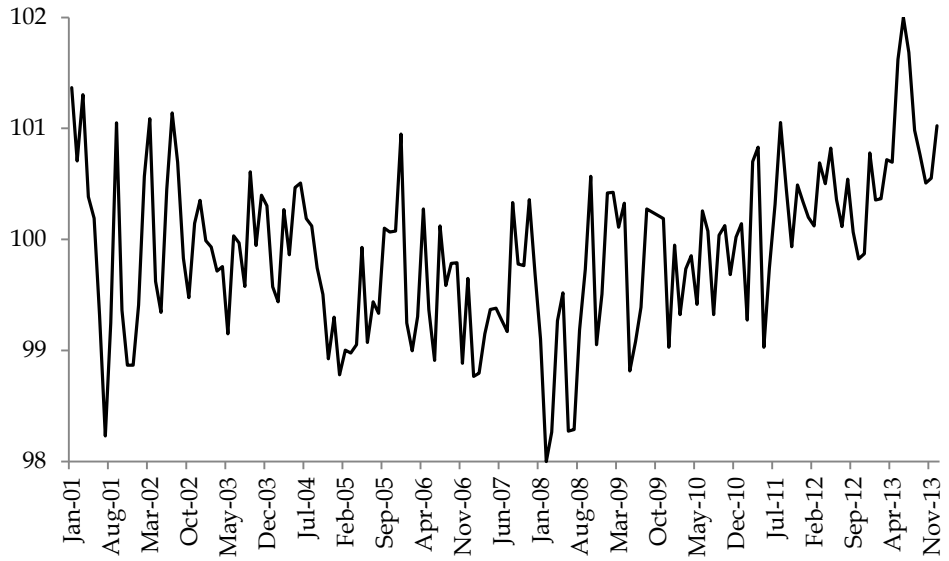
Figures 1 to 4 present the UI for each country from January 2001 to December 2013. To depict the overall impact of uncertainty in the PIGS, we construct the Eurozone Periphery UI calculated as the weighted average of their annual GDPs (Figure 5).

Greece joined the common currency accompanied by a climate of stability and well-being with regard to the future prospects of the economy. However, the situation alters after 2008 (Figure 1). Since the onset of the current financial crisis, Greece has been hit by a series of uncertainty shocks. The economic activity of Greece has been negatively affected by the heightened uncertainty about its economic and political developments.

Figure 1 presents the evolution of UI for Greece from January 2001 to December 2013.

FIGURE 1

UI for Greece



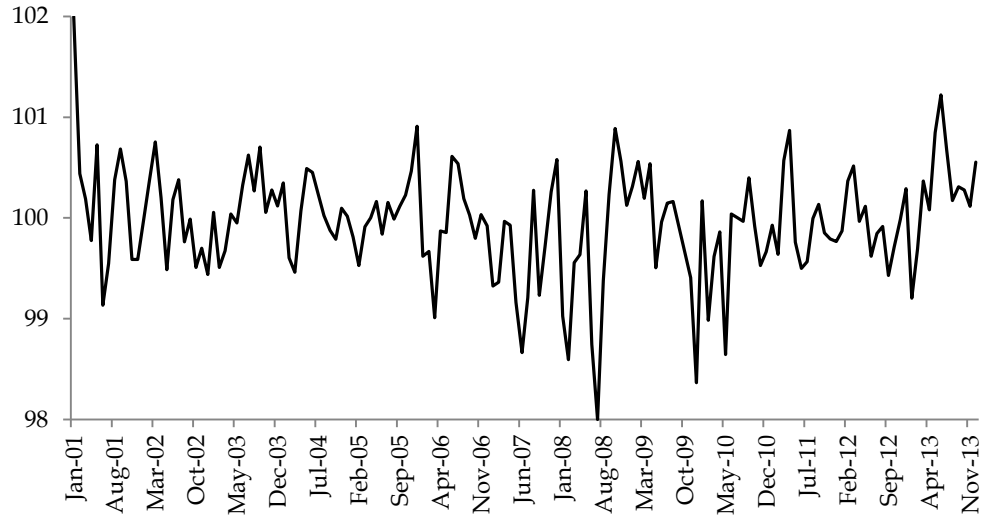
The UI stood at high levels in January 2001, falling to very low levels 6 months later, on July 2001. Subsequently, the Greek economy was affected by significant negative events that occurred at the global level (e.g. the US terrorist attack of 9/11/01). Failure of Greek governments to limit the excessive public deficit resulted in the Economic and Financial Affairs Council giving notice to Greece to take further measures for its reduction.

The collapse of US investment bank Lehman Brothers in September 2008 also created a climate of extreme uncertainty in the European financial system. Despite assurances from banking and governmental influences on the stability of the Greek banking sector, the uncertainty that prevailed in the autumn of 2009 until the activation of the financial support mechanism for the Greek economy (May 2010) hit the domestic banking system. The prevailing characteristic of the uncertainty was deposit outflows. In August 2011 in a recessionary environment, the Standard and Poor's rating agency downgraded Greece's credit rating. Political instability and fiscal adjustment measures exacerbated the uncertainty shooting the index up to pre monetary union integration levels.

The UI in Portugal followed a similar course to that of Greece since January 2001 (Figure 2). The downgrading of Portugal by the three major rating agencies (Fitch, Moody's, and Standard and Poor's) in the second half of March 2011 contributed to the worsening of the economic climate. One month later, the European Council agreed on a financial assistance package for Portugal totaling €78 billion. Figure 2 presents the evolution of UI for Portugal from January 2001 to December 2013.

FIGURE 2

UI for Portugal

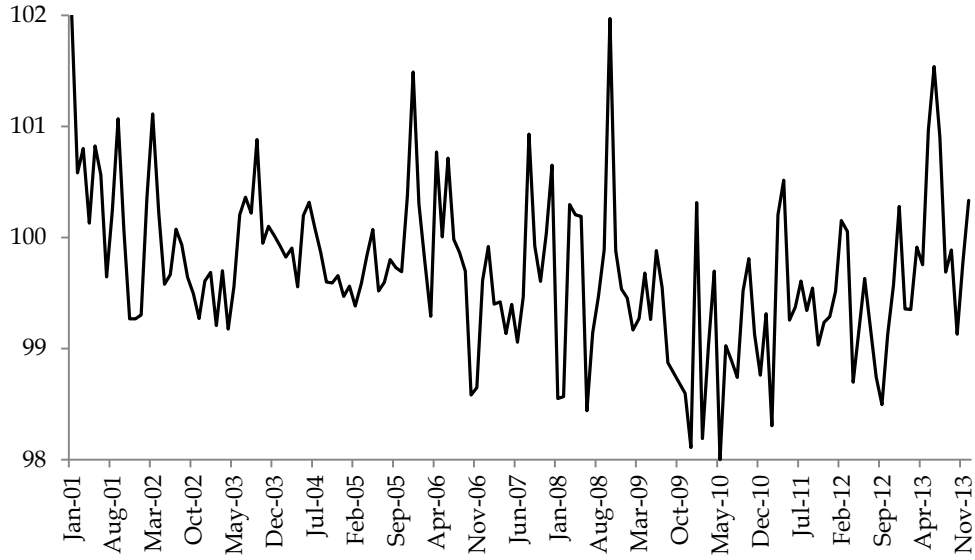


There was a similar de-escalation of uncertainty in Spain from 2001 (Figure 3). The 2008–2013 Spanish financial crisis was generated by the high leverage of the banking system that lead to the bankruptcy of major companies resulting in an increased unemployment rate. The Spanish real estate bubble was funded through its banking system. The events surrounding the Lehman Brothers collapse did not leave the UI unaffected, a spike is noted. The deterioration of the Spanish economy after 2008 and the Eurozone debt crisis boosted the uncertainty.

The continuous downgrading of the Spanish economy in October 2011 by Moody's and Fitch exacerbated the climate of uncertainty. In May 2012 the credit rating of several Spanish banks were downgraded to "junk" status. Figure 3 presents the evolution of UI for Spain from January 2001 to December 2013.

FIGURE 3

UI for Spain



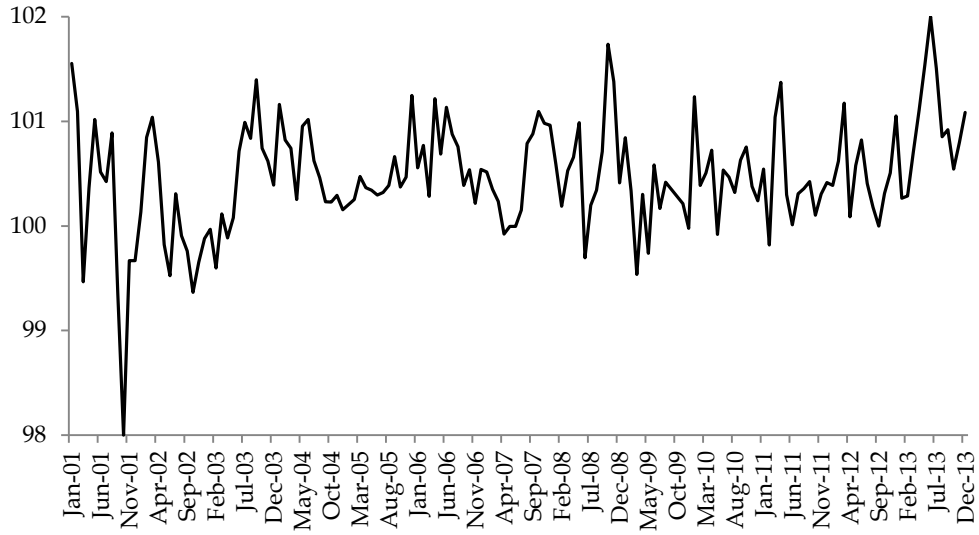
The Italian index reveals the smallest volatility compared with the other periphery countries (Figure 4). The main events that took place during this period worked towards strengthening the uncertainty climate. The crisis of 2008 strengthened the generalized uncertainty: particular factors contributing to this were high public debt and concerns relating to its payback. In August 2011, the European Central Bank announced that it would buy Italian bonds to bring down the cost of borrowing for Italy. On April 2012, the borrowing cost increased and new concerns about Italian debt emerged.

The climate of political instability that prevailed after the failure to form a government in the first quarter of 2013 resulted in Italy's UI reaching its highest level for over a decade.

Figure 4 presents the evolution of UI for Italy from January 2001 to December 2013.

FIGURE 4

UI for Italy

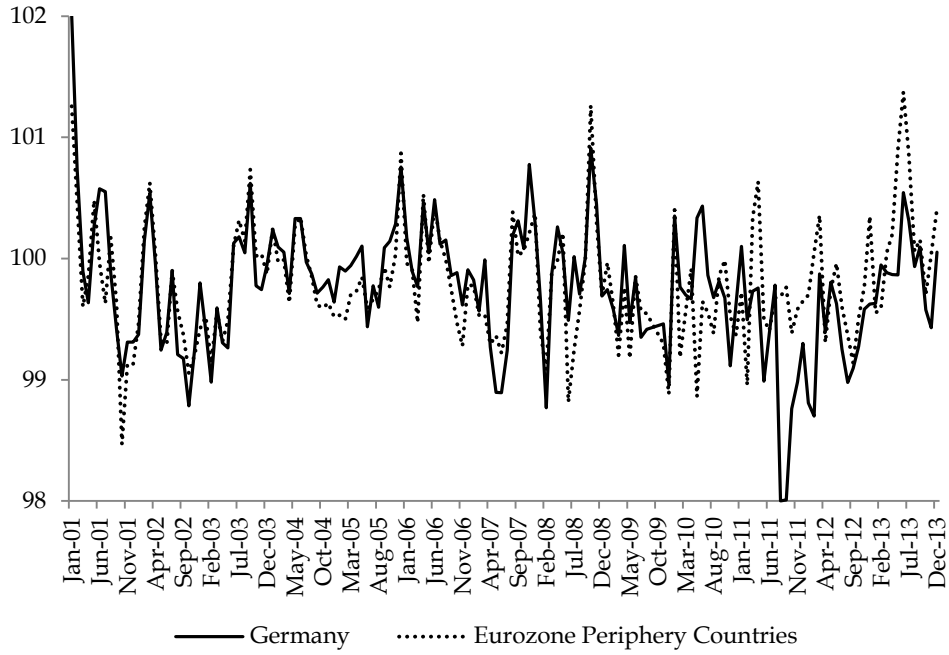


The combined Eurozone periphery UI is compared with Germany's UI in Figure 5. This index includes all significant events during this period that contributed to the escalation of uncertainty, including: the US World Trade Center attacks (September 2001), the attack on Afghanistan (March 2002), the WorldCom scandal (June 2002), the military operation on Iraq (September 2003), the start of the US subprime credit crisis (late 2007), the collapse of Lehman Brothers (September 2008), and the Eurozone debt crisis (2008–2013).

Figure 5 presents the evolution of UI for the Eurozone periphery countries and Germany from January 2001 to December 2013.

FIGURE 5

UI for the Eurozone periphery countries vs. UI for Germany[1]



The joining of these countries to the common currency worked towards a de-escalation of the uncertainty that had prevailed until then. Until the outbreak of the financial crisis, Germany's index followed a similar course to the other countries as it had eliminated certain risks, particularly the exchange risk.

The Cypriot banking crisis in mid-2013 and Cyprus joining the Economic Adjustment Programme in April 2013 raised serious concerns in European economies. The haircut in deposits and concern for their safety heightened the uncertainty levels. This is characterized by the UI spike in June 2013.

Table 2 presents the correlation matrix between the UI of Germany and the peripheral Eurozone 2001−2013. Table 3 shows the same correlation matrix but for a more limited time period: from the emerging economic crisis (2009) up to 2013.

[1] The UI for the European Periphery countries is calculated as a weighted average of the annual GDP.

TABLE 2

Correlation matrix (January 2001−December 2013)[2]

	UI Greece	UI Portugal	UI Spain	UI Italy	UI Germany	UI Eurozone Periphery
UI Greece	1					
UI Portugal	0.617**	1				
UI Spain	0.447**	0.693**	1			
UI Italy	0.378**	0.498**	0.559**	1		
UI Germany	0.176*	0.428**	0.587**	0.626**	1	
UI Eurozone Periphery	0.542**	0.716**	0.846**	0.906**	0.669**	1

TABLE 3

Correlation matrix (January 2009−December 2013)[3]

	UI Greece	UI Portugal	UI Spain	UI Italy	UI Germany	UI Eurozone Periphery
UI Greece	1					
UI Portugal	0.689**	1				
UI Spain	0.656**	0.786**	1			
UI Italy	0.700**	0.689**	0.835**	1		
UI Germany	0.219	0.257	0.312*	0.465**	1	
UI Eurozone Periphery	0.753**	0.804**	0.951**	0.958**	0.401**	1

While all correlations between the UI of the Eurozone periphery countries are increased when the time period is limited in the years of the recession (Table 3) (meaning concurrent increase in the UI of the Eurozone periphery), this is not the case in the correlation between the German UI and the Eurozone periphery UI which is decreased in the time period of the recession (meaning that uncertainty in Germany was decreased or was not increased in the same level as in the Eurozone periphery). More precisely, the correlation between the UI of the periphery and that of Germany for the total period under investigation is 0.669 and is statistically significant at 1%. In contrast, since 2009 the correlation stands

[2] *Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed).

[3] Same as previous.

at 0.401 (statistically significant at 1%), which is (albeit weak) evidence for the differential effect of the recession in European countries.

To identify the impact of an uncertainty shock on the real economy, we use an impulse response model for various time lags. Based on the Schwarz information criterion the proper time lag is 2. An uncertainty shock in the real economy is considered as any event that may affect the stability and future prospects for the course of the economy.

Figure 6 depicts the response of manufacturing production to a 2% uncertainty shock in Portugal, Spain, Greece, Italy and Germany. Manufacturing production falls after a spike in uncertainty; the time lags of Portugal and Italy are two and three months, respectively.

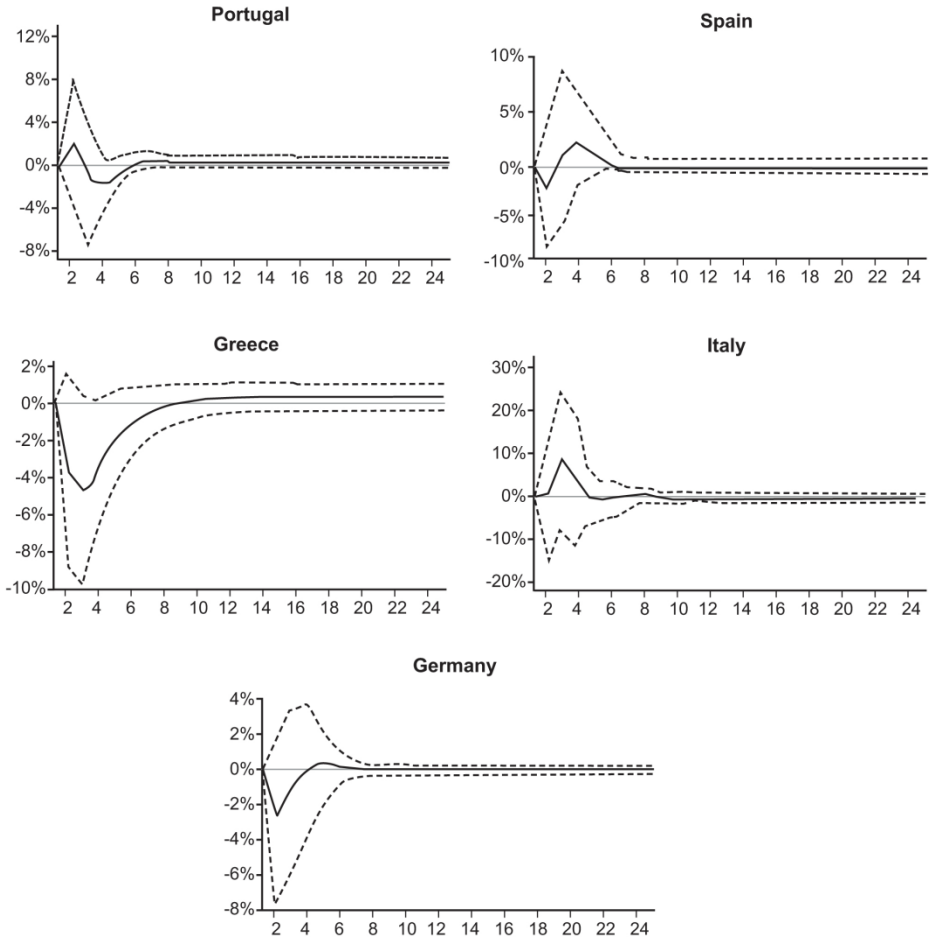
Uncertainty shocks are found to affect real economic activity, as captured by manufacturing production. Specifically, increased uncertainty does not seem to affect the manufacturing production in Portugal at its outset, as production increased by 2% two months after the shock. However, in the third month manufacturing production falls to −1.5%. Production begins to rebound in month four, returning to its initial level in month five.

A 2% uncertainty shock in the Spanish economy leads to a 2% manufacturing production reduction in the second month. The economy rebound starts just two months after the initial shock. Consequently, manufacturing production follows an upward course until the fourth month. Seven months after the shock, its impact on the economy is eliminated.

An increase in uncertainty in the Greek economy by 2% is accompanied by a decrease in manufacturing production by 4.5% three months after the initial shock. This effect appears limited as the manufacturing production quickly rebounds after three months, returning to its initial levels in the tenth month.

FIGURE 6

Manufacturing production response to a 2% uncertainty shock[4]



Italy's pattern follows that of Portugal. There is a three-month lag in the uncertainty shock affecting the Italian economy. The manufacturing production shrinks by 8% over two months (between the third and fifth month after the initial shock). In the sixth month it notes a marginal negative performance, with the effect fading after 13 months.

The fact that a positive spike in production level with a lag after an uncertainty shock is preserved for Italy and Portugal is interesting. The positive effect on industrial production after a negative event can be explained as a signal of market distortions. These kind of distortions create market failures which could be a precursor for market reaction.

[4] The discontinuous red lines represent a ±2 standard error.

For Germany, the impact of uncertainty on manufacturing production is slightly less than 2.5% in the second month. The impact of the initial shock is limited after seven months. The recovery after the sudden manufacturing production decrease is quite fast with the economy starting to recover after the second month. The German economy subsequently follows an upward course, stabilizing in the eighth month after the uncertainty shock.

Two robustness tests are undertaken to check that the baseline model does not fall short of key dimensions that may be central to the results. Thus, we consider two changes to the baseline model that serve as robustness checks: changing the number of lags, and switching the variable order. The first robustness test is to increase the number of lags in the VAR. Although we have consistently applied the Schwartz criterion to select the appropriate lag length, some residual serial correlation may remain. Taking into account the monthly nature of the data, we check that our results are robust to varying lag lengths by estimating the baseline VAR model with seven lags. Apart from an increased "jaggedness" in the variable responses the uncertainty shock response patterns are broadly similar to the baseline model estimated with an optimal lag-length criterion. The second robustness test is to alter the ordering of the variables in the VAR: their order is important in identifying orthogonal shocks. We perform this test accounting for all possible variable ordering. Thus, we plot the uncertainty variable in first, second, third, fourth and last position. No significant differences are revealed and the uncertainty shocks have almost the same effects as in the basic VAR where the UI is placed first.

6. Conclusions

This paper sought to measure the uncertainty levels in the PIGS countries and Germany, by constructing a UI based on the volatility of their main stock indexes. The paper concludes that uncertainty shocks have a substantial impact on economic activity and specifically on the manufacturing production of the Eurozone periphery.

The UI for the Eurozone periphery from the adoption of the euro (January 2001) up to December 2013, explicitly and adequately reflects the economic, political and social conditions at both European and global level. All main events that characterized the development of the PIGS countries since the adoption of the euro are depicted in the peaks and troughs of the UI evolution.

The peak impact of an uncertainty shock of 2% affects industrial production, specifically manufacturing production. Such an uncertainty

shock in the Eurozone periphery dissipates in approximately five to 13 months.

The results of our analysis are in agreement with relevant studies (e.g. Baker et al. 2011; Alexopoulos and Cohen 2008) indicating that negative effects affects economic activity. Shocks to uncertainty can explain business cycles and financial crises.

Uncertainty is a prevailing characteristic of every aspect of private, social and economic life in the Eurozone periphery. The presence of high uncertainty is a constraint to entrepreneurship as it contracts economy dynamics.

A characteristic of the permanent presence of high uncertainty levels is the prevalence of standard small-to-medium sized companies. This has consequences such as: a) the absence of innovation; b) the prevalence of small-scale businesses; and c) the occasional prevalence of "bank liquidity panic" conditions.

The effect of uncertainty in an economy can be specified at macro and micro levels. At the macro level, the uncertainty has an impact on fiscal and monetary policy. Greater uncertainty may affect the strength of monetary policy. A recessionary economic environment in conjunction with high uncertainty requires that monetary policy needs to respond aggressively to a downturn. Additionally, high uncertainty reduces the effectiveness of austerity measures. At the micro level, heightened uncertainty motivates firms and households to delay their consumption and investment decisions. As a result, the potential output of the economy is constrained, deepening the recession.

The management of uncertainty and willingness to take risks are issues of particular importance. Improvement in the institutional framework of the southern European economies can help reduce uncertainty. A well-established institutional framework will induce investors to start entrepreneurial activity. Note that by default the institutional build up aims to mitigate uncertainty (i.e., northern European countries).

Future research may use a corresponding analysis to examine the impact of uncertainty shocks on other macroeconomic variables such as employment, GDP growth, and household behavior. It is important to identify the source of these shocks. Finally, other uncertainty measurements could be used to check whether the effects of uncertainty shocks differ when other measures are taken into account.

References

Alexopoulos, M., Cohen, J., (2008) *Uncertainty and the Credit Crisis*, VoxEU, December 23.

Alexopoulos, M., Cohen, J., (2009) 'Uncertain Times, Uncertain Measures', Working Paper, 352.

Bachmann, R., and Bayer, C., (2011) *Uncertainty Business Cycles- Really?*, http://www.wiwi.unibonn.de/bayer/Working_Papers_files/bachmann_bayer_UBCR.pdf

Bachmann, R., Elstener, S., and Sims, E., (2010) *Uncertainty and Economic Activity: Evidence from Business Survey Data*,

http://www.nd.edu/~esims1/bachmann_elstner_sims_current.pdf

Baker, S., Bloom, N., Davis, S., (2011) *Measuring Economic Policy Uncertainty*, http://faculty.chicagobooth.edu/steven.davis/pdf/PolicyUncertainty.pdf

Belke, A., Goecke, M., (2005) 'Real options effects on employment: Does exchange rate uncertainty matter for aggregation?', *German Economic Review* 6: 185-203.

Bekaert, G., Hoerova, M., and Lo Duca, M., (2013) 'Risk, uncertainty and monetary policy', *European Central Bank Working Paper Series* No 1565, July 2013.

Bernanke, B., (1983) 'Irreversibility, uncertainty and cyclical investment', *Quarterly Journal of Economics* 98: 85–106.

Bhagat, S., and Obreja, I., (2011) 'Employment, corporate investment and cash flow uncertainty', working paper, September.

Black, F., (1987) *Business Cycles and Equilibrium*, Basil Blackwell, New York.

Blackburn, K. and Pelloni, A., (2005) 'Growth, cycles and stabilisation policy', *Oxford Economic Papers* 57: 262-82.

Bloom, N., (2009) 'The impact of uncertainty shocks', *Econometrica* 77(3): 623-685.

Bloom, N., Floetotto, M., and Jaimovich, N., (2011) 'Really uncertain business cycles', Stanford

University working paper.

Bonn, B., and Pfeifer, J., (2011) 'Policy risk and the business cycle', University of Bonn mimeo.

Chen, J., Prakash, K., Prakash, L., and Bharat, T., (2011) 'New evidence on cyclical and structural sources of unemployment', IMF Working Paper, May.

Chugh, S. K., (2011) 'Firm risk and leverage-based business cycles', University of Maryland, Kiel Institute.

DeMarzo, P. M., and Sannikov, U., (2006) 'Optimal security design and dynamic capital structure in a continuous-time agency model', *Journal of Finance* 61(6): 2681-724.

Denis, S., and Kannan, P., (2013) The Impact of Uncertainty Shocks on the UK Economy, IMF Working Paper 13/66.

Dixit, A., and Pindyck, R., (1994) *Investment Under Uncertainty*. Princeton, NJ: Princeton University Press.

Driver, C., and Moreton, D., (1991) 'The influence of uncertainty on UK manufacturing investment', *The Economic Journal* 101(409): 1452-9

Durnev, A., (2010) *The real effects of political uncertainty: Elections and investment sensitivity to stock prices* http://ssrn.com/abstract=1549714 or http://dx.doi.org/10.2139/ssrn.1549714

European Commission, (2012) 'The second economic adjustment programme for Greece, first review', Occasional Papers 123, December.

Fernandez-Villaverde, J., Guerron-Quintana, P., Kuester, K., and Rubio- Ramirez J., (2011) *Fiscal Volatility Shocks and Economic Activity*, University of Pennsylvania mimeo.

Furceri, D., Mourougane, A., (2009) 'The effect of financial crises on potential output: New empirical evidence from OECD countries', OECD Econ. Dep. Work. Pap. 699.

Gilchrist, S., Sim, J. W., and Zakrajsek, E. (2010) *Uncertainty, Financial Friction and Investment Dynamics*,

http://www.princeton.edu/economics/seminar-schedule-by-prog/macro-s10/papers/Gilchrist-Paper.pdf

IMF, (2012) 'Coping with high debt and sluggish growth', World Economic Outlook, Washington DC.

Knotek, E., and Khan, S., (2011). 'How do households respond to uncertainty shocks? ', *Kansas City Federal Reserve Board Economic Review*, Second Quarter.

Narita, F., (2011) *Hidden Actions, Risk-Taking, and Uncertainty Shocks,* University of Minnesota, February.

Panousi, V., and Papanikolaou, D., (2011) 'Investment, idiosyncratic risk and ownership', *Journal of Finance*, forthcoming.

Pastor, L., and Veronesi, P., (2011a) 'Uncertainty about government policy and stock prices', *Journal of Finance,* forthcoming.

Pastor, L., and Veronesi, P., (2011b) 'Political Uncertainty and Risk Premia', working paper, University of Chicago, September.

Romer, C., (1990) 'The great crash and the onset of the great depression', *Quarterly Journal of Economics* 105: 597-624.

Said, E., and Dickey, D., (1984) 'Testing for unit roots in autoregressive-moving average models of unknown order', *Biometrika* 71(3): 599–607.

Sandmo, A., (1970) 'The effect of uncertainty on saving decisions', *Review of Economic Studies* 37 (3): 353-60.