

**The perception of unconventional economic policies and their effectiveness:  
An international assessment**

Marie-Hélène Gagnon<sup>‡</sup>

Céline Gimet<sup>©</sup>

This version: May 2018

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<sup>‡</sup> Associate Professor of Finance, Department of Finance, Insurance and Real Estate, FSA Faculty of Business Administration, Université Laval (Laval University), Quebec City QC Canada G1V 0A6. Research Fellow at HEI (Hautes Études Internationales), CREEP (Centre de recherche sur les risques, les enjeux économiques, et les politiques publiques) and CEPCI (Centre d'études pluridisciplinaires en commerce et investissements internationaux). Corresponding author.

<sup>©</sup>Professor of Economics, Institute of Political Studies, CHERPA, EA 4261, Aix-en-Provence and CNRS, GATE Lyon St Etienne, University of Lyon, Ecully F-69130, France.

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**ABSTRACT**

This paper measures the impacts of unconventional monetary and fiscal policies on consumers' confidence and investors' sentiment as well as on actual consumption and investment in the US, Canada and in the Eurozone during the last decade using Bayesian structural VAR and Global VAR models. The results reveal that consumer confidence and investor sentiment are good metrics to immediately assess the relevance of shocks on unconventional monetary policy as well as fiscal expenditure measures. Moreover, international spillovers suggest that a new policy-mix coordinated at an international level is a prerequisite for ensuring short-term growth recovery after a significant global negative shock.

# **The perception of unconventional economic fiscal and monetary policies and their effectiveness: An international assessment**

## **1/ Introduction**

Prior to the 2007 financial meltdown, central banks have generally succeeded in targeting low inflation rate (Bernanke, Reinhart and Sachs, 2004) and short term budgetary measures have been efficient in time of economic slowdown in producing a well-done standard policy-mix (Auerbach 2003). As a result, nominal interest rates were low and deficit sustainable during this period in major industrialized countries. However, since 2007, the chains of financial turmoil that were unfolded by the credit freeze, the subsequent global meltdown and later, the European bond crisis generated major changes in the implementation of short term economic policies. In fact, conventional monetary (lowering interest rates) and fiscal policies (stimulus government spending) were either not available or did not offer as much upside in terms of economic growth. Thus, unconventional policies were required and implemented. Different type of actions have been envisaged. In the US, a policy-mix of quantitative easing and government spending aimed to avoid a deep recession, whereas, in the Eurozone, a monetary policy that places the banking sector at the core of the growth recovery process combined with a substantial consolidation that follow a short period of expansion has been preferred. However, the effects of such different policy-mix of the real and financial sectors were difficult to anticipate and understand by investors, consumers and policy makers for lack of previous evidence.

A recent and growing strand of literature investigates the effective impacts of such measures on the real economy as well as on the financial markets (Auerbach and Gorodnichenko, 2012a; Baum, Poplawski-Ribeiro and Weber, 2012; Joyce, Miles, Scott and Vayanos, 2012; Gambacorta, Hofmann and Peersman, 2014; Rogers, Scotti and Wright, 2014). These contributions emphasize the pros and cons of the quantitative easing policy and the determining role of the budgetary multiplier.

This paper contributes to this literature by documenting the domestic and international impacts of such policies through indicators of confidence/sentiment and macroeconomic indicators. Using data from the 2002-2015 period and several VAR models (Bayesian VARs as well as GVARs), we obtain impulse response functions as well as variance decompositions following shocks in unconventional monetary and fiscal policies. Our study focuses on the responses of consumption and investment as well their anticipations measured via consumer confidence and investor sentiments. Measuring the response of consumer confidence and investors sentiment is relevant to assess the performance of these economic

policies for several reasons. First, because these policies were innovative and their effects were not well understood at the time of their undertaking for lack of objective time-period data, we investigate whether their original perception measured through consumers' confidence and investors' sentiment was different from the actual economic and financial outcome. Second, while it is generally recognized that growth's response to economic policies are delayed (Sims and Zha, 1999; Kim and Roubini, 2000, Mountford and Uhlig, 2009; Almunia et al., 2010), these physical limitations are not as binding for sentiment measures. If sentiment and confidence indexes are predictors of future economic activity, policy makers could monitor the short run outcomes of a given policy by following sentiment index responses. Thus, a valid question for policy makers is whether monitoring sentiment and confidence measures in the aftermath of a policy change in order to forecast the actual effects is accurate. Third, using these variables could reconcile the theoretical and empirical literature documenting budgetary policies. Ramay (2011) explains the important differences between the predictions of theoretical Keynesian approach and the empirical findings. She argues that VAR models typically used in empirical analysis capture shocks on consumption and investment "too late" and don't account for anticipations. Therefore, introducing confidence and sentiment measures that potentially forecast future realisations could alleviate this issue. Fourth, sentiment and confidence indexes could be especially relevant in the international context because a strand of the literature suggests that sentiment generate growth on their own (e.g Carroll, Fuhrer and Wilcox, 1994). Finally, investors sentiment has an international transmission process (Baker Wurgler and Wang, 2012; Dees and Brinca, 2013 and Easaw, Garratt and Heravi, 2005) that could matter when one aims to measure the international spillovers of economic policies. Thus, studying how these indicators react after the introduction of unconventional policies could shed new light on how they were originally understood and perceived and how such sentiments propagated across markets.

Our results underscore four distinct findings with important policy implications. First, consumers and investors' perceptions of innovative economic measures should be considered to study the pass-through of economic policies to the real sector particularly in times of crisis, zero lower bound interest rates and global liquidity growth. Second, our results are in line with the existing literature and suggest that *QE* was effective to stimulate consumption and investment in the US while credit easing had little positive impact in Europe. Our results extend these findings to sentiment and confidence measures and show that such indicators often precede the actual response. Third, fiscal policies were heterogeneous during this period and their impacts were different and dependent on the zero lower bound context. Finally, when international spillovers were measured, they were in the same direction as the domestic

effects. International spillovers were particularly important for *QE* measures as well as increase in U.S government spending. Our results underscore the role of a new policy-mix enhanced by a strong forward guidance coordinated at an international level to recover for economic turmoil.

## **2. Literature review**

### **2.1. Unconventional monetary policies**

During *normal* periods, monetary policy influences the domestic economy through three main transmission channels: interest rates, the credit channel and asset prices. At an international level, the spillovers depend on the country's degree of financial integration and on the exchange rate regime (Canova, 2005).

The 2007-2009 liquidity crisis questioned the efficiency of these traditional channels in particular with the increase in risk premium and the interbank credit freeze. Traditional monetary measures were inefficient to restore liquidity and growth (Gagnon and Gimet, 2013). In fact, conventional central banks interventions had been pressed to the maximum: the refinancing operations rates had reached the zero lower bound in many developed countries, refinancing conditions had been relaxed, six major central banks including the European Central Bank, US Federal Reserve, Bank of Canada, Bank of England, Bank of Sweden and Bank of Switzerland cut their interest rate by 0.50 percentage points simultaneously to shock the financial market. Unfortunately, these measures didn't produce any real positive effects in the economy (Cecchetti, 2008). Consequently, since the end of 2008 the major central banks have deployed new types of instruments of unconventional monetary policy.

#### *2.1.1 Quantitative easing (QE)*

*QE* has been preferred in the US, in Japan, in the UK and lately in the Eurozone (January 2015). *QE* involves an increase in the size of the Central banks' balance sheets by direct purchase of assets coupled with forward guidance when central banks deem it necessary (Joyce, Miles, Scott and Vayanos, 2012, Hausken and Ncube, 2013, Borio and Zabai, 2016). The literature suggests that *QE* lowers both yields and long term interest rates with a positive effect in the short term on economic growth (Joyce, Miles, Scott and Vayanos, 2012 ; Gambacorta, Hofmann and Peersman, 2014). Theoretical models further argue that the signal provided by the Central Bank to the private sector regarding the future level of short term interest rates amplifies the positive effects on consumption and investments. (Bauer and Rudebusch, 2014; Bhattarai, Eggertsson and Gafarov, 2015). Moreover, a portfolio balance channel can

improve consumption by changing the term premia which encourages market agents to change their asset holdings according to the preferred habitat hypothesis (Fratzscher, Lo Duca and Straub, 2018). At the international level, the exchange rate channel of transmission strengthen the interest rate channel impacting the international credit as well as long-term interest rates and securities flows (Rogers, Scotti and Wright, 2014).

### 2.1.2 Credit easing (CE)

The Eurozone implemented a *credit easing* policy placing the banking sector at the core of the recovery by offering liquidity in order to enhance domestic credit. *CE* consists in enlarging the list of collateral eligible assets for refinancing in the banking sector. It also aims to increase the maturity of loans and reduce discounts applied to collaterals. Since December 2011, *CE* is performed through Long Term Refinancing Operations (LTRO). The objectives are: to provide banks with liquidity at a three years maturity, a reduction in the reserve ratio (from 2% to 1%), an increase in collateral availability and since June 2014, negative deposit facility interest rates (Borio and Zabia, 2016). *CE* does not involve money supply fluctuations in the medium term because of the banks' repayments entail a sterilization operations. Consequently, Peersman (2011) show that the effectiveness of *CE* policy is mitigated, particularly during deflation pressures.

## 2.2 Budgetary policies

### 2.2.1 Expansionary policies

In 2008, all industrialized countries' government implemented a policy mix aimed at sustaining economic growth (Gagnon and Gimet, 2013). In particular, the United States adopted the American Recovery and Reinvestment Act in February 2009 (ARRA) which consist in a stimulus package (tax cuts, social expenditures and public investment). The empirical literature supports the use of short run temporary expansionary fiscal policies in a zero nominal interest rate lower bound context in the United States (DeLong and Summers, 2012). In particular, increase in government expenditures (Christiano, Eichenbaum, Rebelo, 2011; Woodford, 2011) during negative output gap periods (Auerbach and Gorodnichenko, 2012a; Baum, Poplawski-Ribeiro and Weber, 2012) and in weak economies (Auerbach and Gorodnichenko, 2017) have large significant positive effect on production through the consumption transmission channel. Leduc and Wilson (2012) argue that infrastructures expenditures generate the greatest positive effects in the short /medium term on GDP. Battini et al. (2014) documents more

mitigated results regarding the short term effect of tax reduction on GDP). However, Blanchard and Perotti (2002) show that government spending has a negative impact on investment, a surprising results given conventional Keynesian theory. Ramey (2011) expands these conclusions by underscoring the importance of anticipations.

Although a consensus is yet to emerge regarding the effectiveness of tax reductions, the literature underscores the importance of cross-country variations and state-dependent fluctuations (normal or crisis periods) (Blanchard and Perotti, 2002; Spilimbergo, Symansky, and Schindler, 2009). From a theoretical point of view, even if in the short term the impact is null or weak, tax reduction can generate an increase in investment and a positive impact on output in the long term (Zubairy, 2014). Moreover, the literature underscores the importance of the level of interest rates on the effectiveness of tax reduction. In particular, the empirical work of Romer and Romer (2010) and the DSGE model presented in Eggeston (2010) show that the impact of tax reduction on the growth is different according to the levels of interest rates. When interest rates are positive, the effect on growth is positive but when interest rate are at the zero lower bound the effect on growth is negative.

### *2.2.2 Consolidation policies*

In 2011, a sovereign debt crisis followed the liquidity crisis in the Eurozone. A confidence crisis ensued because of the size of the deficits in peripheric countries of the Eurozone and the lack of coordination of European country policy choices (Lane, 2012). In order to restore confidence, European institutions targeted renewed credibility with national austerity plans and budgetary rigor in a consolidation process. McKay and Reis (2016) highlight the importance of the cyclical component in consolidations, the level of interest rate and the level of initial debt to GDP ratio. The value of the budget multiplier (defined as the short term effect of government fiscal policy on economic activity) will depend on whether the objective is unemployment reduction or public finance stabilisation (Jordà and Taylor, 2016). Blanchard and Leight (2013) argue that spending cuts have a negative impact on growth in the short term (budget multiplier is negative). Also, a too brutal or too rapid budgetary effort will result in a depressive effect on economic activity. The academic literature emphasizes that budget consolidation should be gradual, undertaken in growth period and focus on tax increase rather than a reduction in public expenditure (Hall, 2009 ; Christiano, Eichenbaum and Rebelo, 2011 ; Auerbach and Gorodnichenko, 2012a ; Batini, Callegari and Melina, 2012 ; Corsetti, Meier and Müller, 2012). Regional and international spillovers are more important for government spending reduction, in particular during

recession and zero lower bound context and they contribute to the economic recession (Auerbach and Gorodnichenko, 2012b; Blagrove et al., 2017).

### **2.3 Sentiment indexes and macroeconomic and financial fluctuations**

One of the main objective of this paper is to assess whether sentiment and confidence variables can be used to forecast the following economic response to unconventional policies and whether a monitoring strategy based on those proxies would be appropriate.

With regards to the consumer confidence index, it is a popular measure in the literature based on consumer surveys and representing consumers' perception of the present and the near future. There has always been debates about its capacity to predict economic activity (e.g Miskin, 1978, Bram and Ludvigson, 1998). In general, the literature finds consumer sentiment to be a predictors for actual household spending (e.g. Carroll, Fuhrer and Wilcox, 1994; Souleles, 2004; Barnes and Olivei, 2013), but the accuracy of the prediction fluctuates across several factors. Nguyen and Claus (2013) document that confidence reacts with asymmetry to good and bad news in a similar fashion as actual consumption. In addition, much of the evidence presented regarding the forecasting abilities of consumer confidence focuses exclusively the US market. Dees and Brinca (2013) find that the consumer confidence index can be a good predictor of spending in both the US and the Eurozone, but that its predictive power is higher when large fluctuations are reported in the survey index. They also document international transmission of the US sentiment to the Eurozone sentiment. Internationally, Easaw, Garratt and Heravi (2005) find that the UK consumer is a good predictor of durable goods consumption.

Investor's sentiment has been less studied mainly because there is less readily available data and thus, most studies of investors' sentiment imply the construction of an index. Baker and Wurgler (2006) define investor sentiment as *a belief about future cash flows and investment risks that is not justified by the facts at hand*. In financial terms, investors' sentiment could be associated with the parts of anticipations that are not supported by the macroeconomic conditions. It is thus a pure measure of sentiment, orthogonal to the state of the economy. The relationship between stock markets and measures of market sentiment is well documented. The findings are be dependent on the sentiment measure adopted such as IPOs, closed-end fund discount or volatility. For instance Lee, Shleifer and Thaler (1991) and



Neal and Wheatley (1998) show that investors' sentiment significantly affect stock return when it is measured via closed end fund discount, while Qui and Welch (2006) find the opposite and argue that consumer confidence is a better proxy for sentiment. Brown and Cliff (2005) use survey data to measure sentiment and conclude that future return are negatively correlated to sentiment. The negative correlation between sentiment is also observed in Baker and Wurgler (2007) and Baker, Wurgler and Yuan (2012). Baker, Wurgler and Yuan (2012) conclude that when sentiment is high future return are low, translating into harder markets conditions where arbitrage opportunities are difficult to find.

In terms of the relationship between investor sentiment and economic policies, the literature is less developed. Alesina, Favero and Giavazzi (2015) document that in normal period the investors' confidence appears to be more vulnerable to a tax-based adjustments. To our knowledge, this is the first study to investigate how unconventional policies affect measure of sentiments. Thus, it is a dual empirical question whether i) a given public policy affects sentiment and ii) whether that would translate into actual economic growth and prosperity and whether sentiment plays a role into the international transmission channels. The objective here to assess whether such measure can be useful in monitoring public policies. In this paper, we opt for a definition of investor sentiment similar to Baker, Wurgler and Yuan (2012). We argue that given the relative lack of consensus in the scientific literature regarding how to effectively measure investor sentiment, their proposed approach relying on the principal component analysis is conservative and easier to generalize internationally. We base our analysis on both consumer confidence and investors sentiments, as both measures are documented in the literature and could be complementary in explaining the full impacts of unconventional policies.

### **3. Empirical analysis**

#### **3.1. Data**

Our data cover the 2002Q1-2015Q4<sup>2</sup> period. This time period is characterized by an increase in liquidities at an international level (Shin, 2013), low interest rates, and by several innovations in term of economic policies. In order to conduct a study on the perceptions of unconventional fiscal and monetary policies, three categories of variables are needed: policy indicators, sentiment and confidence indicators and macroeconomic indicators which are further detailed in Table 1 and Appendix 1. We focus on three countries/regions: The United States, the Eurozone and Canada as they represent different economic

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<sup>2</sup> The period of analysis stops in December 2015 when the FED increased their interest rates, which represents a return to the normalization of monetary policy.

situations in international markets and because these three regions are interconnected by strong economic and financial links. The United States is an obvious choice, providing an opportunity to further document the US monetary policy transmission mechanism found in the literature (Joyce, Miles, Scott and Vayanos, 2012 ; Gambacorta, Hofmann and Peersman, 2014; Rogers, Scotti and Wright, 2016) as well as to study the international spillovers of US budgetary policies. The Eurozone is the first trading and financial partner of the United States, its size in the world economy is significant and it is characterized by a common monetary policy and national budgetary policies, which adds another dimension to the analysis. Finally, the economic literature stresses the importance of assuming a small open economy when studying the effects of US monetary policy (Cushman and Zha, 1997; Canova, 2005; Mackowiak, 2007). Canada is introduced as a case where this assumption is plausible because the Canadian economy is small compared to the United States and Eurozone (less than 10% of the U.S. market capitalization). Moreover, it is a relevant country to study the international spillovers given Canada's economics and financial linkages with the other regions of the sample.

### *3.1.1. Unconventional policy indicators*

#### *Monetary policies*

Since the unconventional monetary policies undertaken were different across the globe, we use different indicators for the U.S. and the Eurozone. We do not study Canadian shocks since Canada did not resort to unconventional monetary policies. For the U.S, we use the U.S. Treasury securities amount held by the Federal Reserve that reflects the *QE* policy based on the direct purchase of the US government bonds by the US Central Bank (*LMPUS*). The *LTRO* policy of the European Central Bank is measured by the Monthly ECB contributions to the Eurosystem consolidated financial statement (*LMPEURO*).

#### *Fiscal policies*

As the literature does not reach consensus on the relative impact of a budgetary consolidation based on a government spending cuts or on an increase in taxes, we consider both a negative public expenditure shock (*LGOVEXPEURO*) and a positive tax shock for the Eurozone (*LGOVREVEURO*). During the period of our analysis, the USA implemented both direct and indirect supports to households, corporate and financial system. Thus we consider a positive government expenditure shock (*LGOVEXPUS*) and a negative tax shock for the USA (*LGOVREVUS*).

### 3.1.2 Sentiment indicators

We use two sentiment indicators in our analysis since our aim is to identify the impacts of unconventional policies on multiple aspects of sentiments. First, we use the consumer confidence index (*LCCI*) based on households' plans for major purchases and their economic situation, both currently and their expectations for the immediate future. This measure is based on surveys.

We also use an indicator of investors sentiment based on the financial markets and on the literature related to investor's sentiment (*IS*). Baker and Wurgler (2006) and (2007) develop a top-down and macroeconomic aggregate measure of sentiment based on several proxies measuring long trends in financial markets sentiments. Baker, Wurgler and Yuan (2012) generalize the measure to the international markets. Based on this literature, we constructed an indicator of investors' sentiment based on the methodology presented in Baker and Wurgler (2006) and Baker, Wurgler and Yan (2012). Thus, we build an investor sentiment based on three variables: volatility premium (*PVOL*), turnover (*TURN*) and the Number of IPOs (*NIPO*) and coupled with a principal component approach. Appendix 1 summarizes our approach.

We emphasize that both measures capture sentiment/confident differently. Consumer confidence is based on surveys and on consumer's perceptions regarding the near future. It has strong roots in the economic and financial literature. Given that it is based on surveys however, the measures is cannot document how consumer form these anticipations about the future. The measure retained for investor's sentiment is more precise in that respect. Investors' sentiment is based on financial data that have been shown to incur wave cycles associated with sentiment that are not based solely on macroeconomic conditions (such as IPO waves, volatility clusters or volume run ups). In fact, the index is orthogonalized to macroeconomic conditions in order to capture "irrational" sentiment in the financial markets. Thus, both measures are complementary in this analysis.

### 3.1.3. Macroeconomic indicators

To study and compare the impact of these policies on firms vs households, we consider on the one hand the evolution of global consumption (*LCONS*) and on the other hand the reaction of investment (*LINVEST*) and then of GDP (*LGDP*)<sup>3</sup>.

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<sup>3</sup> See Appendix 1.

## 3.2. Empirical analysis: SVAR models

### 3.2.1. Structural form

Our sample contains of 3 countries/regions: USA, Canada and Eurozone. In the case of budgetary policies shocks in the Eurozone, panel data modelling appears well-adapted because of the national independence of these instruments in this region, as it brings out individual heterogeneity and allows us to identify effects that would not be easily detectable with time series or cross-sectional data<sup>4</sup>. We employ a structural VAR modelling framework in order to estimate the dynamic effects of unconventional economic policies on a set of sentiment indicators and real economic variables adjustments. Bayesian inference is used to ensure that the model is not affected by unit-root and cointegration problems (Sims, 1988; Sims and Uhlig, 1980). Thus, all variables are in levels.

Structural Bayesian VAR models are estimated according to the method developed by (Sims and Zha, 1998 and 1999) and based on the available code<sup>5</sup>. As usual, the reduced form of the vector autoregression model VAR( $q$ ) is given as:

$$Y_{i,t} = \sum_{p=1}^q A_p Y_{i,t-p} + e_{i,t} \quad (1)$$

In (1),  $q$  is the number of lags,  $n$  is the number of countries,  $Y_{i,t}$  is the vector of endogenous variable,  $Y_{i,t-j}$  is the  $n \times 1$  vector of lagged variables for each  $i$ ,  $A_p$  is the  $n \times n$  parameter matrix, and  $e_{i,t}$  is the vector of errors with  $e_{i,t} = b_i + b_{it}$  where  $b_i$  is the individual fixed effect,  $b_{it}$  is the disturbance term whose variance-covariance matrix has no restrictions, i.e.  $E(b_{i,t}, b_{i,t}^T) = \Omega$  and  $E(b_{i,t}) = 0$ <sup>6</sup>. Letting  $L$  be the lag operator, the VAR( $q$ ) model can be rewritten as:

$$A(L)Y_{i,t} = e_{i,t} \quad (2)$$

This process is transformed in moving average infinite structural form to yield the impulse response functions and the forecast error variance decomposition. An intermediate step consists in reversing the canonical VAR model using the Wold Theorem. This yields the moving average form:

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<sup>4</sup> In this case, we consider the oldest and heaviest countries of the Eurozone: Austria, Belgium, Estonia, Finland, France, Germany, Greece, Ireland, Italia, Netherland, Portugal, Slovakia, Slovenia and Spain.

<sup>5</sup> The code used is based on the code provided by Zims and Zha (1998 and 1999) available at: [https://www.estima.com/procs\\_perl/mainproclistwrapper.shtml](https://www.estima.com/procs_perl/mainproclistwrapper.shtml). We incorporate individual dummies in order to control for unobservable heterogeneity in the Eurozone (Beetsma et al., 2006; Kim and Lee, 2008; Kim and Yang, 2008) and adapt the model to the case of panel data.

<sup>6</sup> SVAR models (monetary policies and budgetary policies) are estimated with one lag, as is optimal according to the Bayesian Schwartz criterion and appropriate given the limited period (and number of observations) of our study, particularly in the budgetary policies model.

$$Y_{i,t} = \sum_{k=0}^{\infty} C_k e_{i,t-k} = C(L)e_{i,t} \quad (3)$$

where  $e_t$  represents the vector of canonical innovations. The structural Moving Average representation is then:

$$Y_{i,t} = \sum_{k=0}^{\infty} \Theta_k \varepsilon_{i,t-k} = \Theta(L)u_{i,t}, \text{ with } e_t = Pu. \quad (4)$$

$P$  is an  $n \times n$  invertible matrix which has to be estimated to identify the structural shocks. Short-run constraints are imposed by setting some elements of the  $P$  matrix to zero. The  $\Theta_j$  matrix represents the response functions of  $Y_{i,t}$  to structural shocks  $d_{it}$ . These are assumed to be uncorrelated with unit variance:

$$E(d_{i,t}, d_{i,t}^T) = I_n$$

Letting  $\Omega$  be the variance-covariance matrix of the canonical innovations  $b_{i,t}$ :

$$E(b_{i,t}, b_{i,t}^T) = PE(d_{i,t}, d_{i,t}^T)P^T = PP^T = \Omega. \quad (5)$$

On the panel SVAR representation, the reduced form of the vector auto-regression model VAR( $q$ ),  $e_{it}$  is the vector of errors with  $e_{it} = b_i + b_t + b_{it}$  with  $b_i$  the individual fixed effect,  $b_t$  the time fixed effect and  $b_{it}$  the disturbance term whose variance-covariance matrix has no restrictions, that is to say  $E(b_{i,t}, b_{i,t}^T) = \Omega$  and  $E(b_{i,t}) = 0$ . The vector of canonical innovations  $b_{i,t}$  is supposed to be a linear combination of the structural impulses  $d_{i,t}$  at the same time. Thus  $b_{i,t} = Pd_{i,t}$ .

### 3.2.2. Identifications restrictions

We impose only contemporaneous restrictions in our model. Our objective is to identify the  $n^2$  elements of the  $P$  matrix. The  $\Omega$  matrix is symmetric; consequently  $n(n+1)/2$  orthogonalization constraints have already been imposed. It is necessary to determine the remaining six constraints according to the theoretical literature. First, we consider that the monetary and budgetary authority's function of reaction do not respond immediately to a sentiment or a macroeconomic shock due to information delay (Sims and Zha, 1999; Kim and Roubini, 2000, Mountford and Uhlig, 2009; Almunia et al., 2010) and that the foreign economic policies are exogenous in the short term (Mackowiak, 2007; Bénassy-Quéré and Cimadomo, 2012). Second, we follow the hypothesis that sentiment variables are faster to respond to a shock than macroeconomic variables given their nature and that the reaction of real variables to a sentiment shock is postponed to a period (Starr, 2012). Finally, the real supply shock is

supposed to impact the macroeconomic variable with a quarter delay (Blanchard and Perotti, 2002). This ensures that  $P_{21} = P_{23} = P_{24} = P_{31} = P_{41} = P_{43} = 0$ . The model is therefore fully identified.

Formally, the consumption models variables are:

$$Y = \begin{pmatrix} LMP/LGOV \\ LCCI \\ LCONS \\ LGDP \end{pmatrix} \quad (6a)$$

and the investment models variables are  $Y = \begin{pmatrix} LMP/LGOV \\ IS \\ LINVEST \\ LGDP \end{pmatrix}$  (6b)

and  $\varepsilon_t = \begin{pmatrix} \varepsilon_{ep} \\ \varepsilon_{conf/sent} \\ \varepsilon_{macro} \\ \varepsilon_{rs} \end{pmatrix}$ ,

the vector of structural shocks, where  $\varepsilon_{ep}$  represents the shock of economic policy (the unconventional monetary policy or the budgetary policy shock),  $\varepsilon_{conf/sent}$ ,  $\varepsilon_{macro}$  and  $\varepsilon_{rs}$  are, respectively, the consumer confidence or investors' sentiment shock, the consumption/investment shock and the real supply shock.

The matrix of contemporaneous restrictions is laid out as:

$$P = \begin{pmatrix} 1 & 0 & 0 & 0 \\ P_{21} & 1 & P_{23} & P_{24} \\ P_{31} & 0 & 1 & 0 \\ P_{41} & 0 & P_{43} & 1 \end{pmatrix}$$

### 3.3. GVAR model and budgetary policy shocks

In order to study the impact of the budgetary shocks within the Eurozone, Global VAR (GVAR) models (Dees et al., 2007) are implemented<sup>7</sup>. GVAR model are attractive in this context because they allow to study the influence of the common US fiscal shock and the impact of the European national

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<sup>7</sup> We use the code on GVAR model available on L. Vanessa Smith website: <https://sites.google.com/site/gvarmodelling/gvar-toolbox>.

budgetary policies on each countries in the Eurozone while considering the real and financial interdependencies between the economies as channel of transmission.

Our methodology mirrors Dees et al (2007) with the global model based on 16 countries with 14 of these grouped into a single euro area<sup>8</sup>. The country-specific foreign variables were constructed using trade links (Baxter and Kouparitsas, 2004) except for the variable investor sentiment (*is*) for which we considered financial links and use fixed trade and financial weights averaged over the period. To define the specific international shocks for each country or area, the relative weight of country *i* to country *j* is measured by the share of export and import or the share of inflows and outflows of portfolio investment in the total trade and financial links of the country *i*<sup>9</sup>. Two external variables are included in order to take into account the international economic context: interest rate and the evolution of the international liquidity<sup>10</sup>.

The simple VARX( $p_i, q_i$ ) model for country *i* with  $p_i$  the lag order of the domestic variables and  $q_i$  the lag order of the foreign variables is written as follow<sup>11</sup>:

$$Y_{it} = a_{i0} + a_{i1}t + \sum_{p=1}^{p_i} A_{i,p} Y_{i,t-p} + \sum_{q=0}^{q_i} B_{i,q} Y_{i,t-q}^* + e_{it} \quad (7)$$

$t=1, \dots, T; i=0, \dots, N$

with  $x_{i,t}$  the  $k_i \times 1$  vector of domestic variables and  $x_{i,t}^*$  the  $k_i^* \times 1$  vector of foreign variables,  $a_{i1}$  the  $k_i \times 1$  vector of linear trend coefficients,  $A_{i,p}$  the  $k_i \times k_i$  matrix of lagged coefficients and  $B_{i,q}$  the  $k_i \times k_i^*$  matrices of fixed coefficients.  $t=1, \dots, T, i=0, \dots, N$ , the set of countries take the value 0 for the reference country (the United States).  $e_{i,t}$  is the  $k_i \times 1$  vector of country specific shock whose the variance-covariance matrix has no restrictions, that is to say  $E(e_{i,t}, e_{i,t}') = \Omega$  and  $E(e_{i,t}) = 0$ .

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<sup>8</sup> Following Dees et al. (2007) weights aggregation is based on the average 2002-2015 GDP, PPP (in thousand current international \$).

<sup>9</sup> To converge with the SVAR analysis, only foreign political variables are taken into account in addition to domestic ones. Moreover, the lag orders of the domestic  $p_i$  and foreign variables  $q_i$  of the individual country VARX models are fixed to 1 because of the reduced size of the period of analysis. All results are available upon request.

<sup>10</sup> Respectively the US interest rate (monetary policy-related interest rate, percent per annum, IMF-IFS) and OECD M3 (seasonally adjusted index based on 2010=100).

<sup>11</sup> In order to obtain the GVAR model, individual models should account for possible cointegration across variables in each country's model.

$Y_{it}^* = \sum_{j=1}^N w_{ij} Y_{jt}$  and  $w_{ii} = 0$ ,  $w_{ij}, j = 0, \dots, N$  represent the fixed trade and financial weights such as  $\sum_{j=1}^N w_{ij} = 1$ .

If we suppose that

$$Z_{it} = \begin{pmatrix} Y_{it} \\ Y_{it}^* \end{pmatrix}$$

And  $Z_{it} = W_i Y_t$  with  $W_i$  the  $(k_i + k_i^*) \times k$  trade weights or financial weights matrix

$$H_{io} Z_{it} = h_{io} + h_{i1} t + H_{i1} Z_{it-1} + \dots + H_{i,p_i} Z_{i,t-p_i} + e_{it}, \quad (8)$$

where  $H_{io} = (I_{k_i}, -B_{io})$ ,  $H_{i1} = (A_{i1}, B_{i1})$ ,  $H_{ij} = (A_{ij}, B_{ij})$ , for  $j = 1, \dots, p_i$ .

These models can be compiled in a GVAR( $p$ ) Model:

$$G_o Y_t = h_{io} + h_{i1} t + G_1 Y_{t-1} + \dots + G_p Y_{t-p} + e_t \quad (9)$$

With  $b_o$  and  $b_1$  the  $k \times 1$  vector of coefficients,  $F$  the  $k \times k$  matrix of coefficients and  $\varepsilon_t$  the  $k \times 1$  vector of reduced form shocks which are linear functions of the country-specific shocks  $e_{i,t}$ . The countries specific models can be combined to form the Global VAR( $p$ ) model with the  $k \times 1$ ,  $k = \sum_{i=0}^N k_i$ , global vector  $Y_t = (Y'_{0t}, \dots, Y'_{Nt})$ , where all the variables are endogenous:

$$Y_t = b_o + b_1 t + F_1 Y_{t-1} + \dots + F_p Y_{t-p} + \varepsilon_t \quad (10)$$

We suppose that the country specific error  $e_t$  follow a multivariate normal distribution, consequently the GIRF (generalised impulse response functions) of a one standard deviation shock, invariant to the ordering of the variables, allow studying the impulse response function at time  $t$  to the  $l^{th}$  equation of the model on the  $j^{th}$  variable.

#### 4. Results

Regarding the countries' reactions to different types of policy shocks, the significance of the results is judged from the graphs illustrating the responses of macroeconomic and sentiment/confidence variables following a variation of a standard deviation of the economic policy variable (Appendix 1). The confidence intervals for the impulse response functions based on structural Bayesian vector



autoregressive models are obtained from the procedure proposed by Sims and Zha (1999)<sup>12</sup>. The Generalized Impulse Response Functions and the standard errors are obtained from the GVAR models following the methodology presented in Dees et al. (2007).

#### **4.1. Unconventional monetary policy**

##### *4.1.1. US shocks- quantitative easing*

Figure 1 present the impulse response functions following a *QE* shock while variance decompositions are reported in Table 2. Domestically, we find that both consumption (*LCONSUS*) and consumers sentiment (*LCCIOUS*) reacts positively and significantly to a US *QE* shock. The shock also has a positive but delayed impact on *GDP* both in terms of impulse response and variance decomposition. While the financial market's sentiment (*ISUS*) is only slightly affected by the shock in the short term, the positive effect on investment (*LINVESTUS*) is delayed by a quarter, and significant but the variance decomposition stays low. Thus, both consumers and investors' sentiments responses to the shock in the short term could be good predictors of the actual responses on consumption and investment.

Internationally, shocks in unconventional US monetary policy are more important for Canada than for Europe. The low variance decomposition in Europe suggest that the significant positive spillovers on all variables from the impulse responses are modest. In Canada however, the positive spillovers are important in terms of variance decomposition. In particular, Canadian consumer sentiment (*LCCICAN*) is positively affected by the US shock and the variations in US monetary policy are associated with up to a quarter of the fluctuation in consumer sentiment in Canada. Canadian consumption (*LCONSCAN*) and GDP (*LGDPSCAN*) are also positively influenced by the shock. However, investor's sentiment (*ISCAN*) is negatively impacted by the US shock while there is little effect on Canadian investment (*LINVCAN*) in terms of variance decomposition. Thus, we conclude that unconventional measure were not perceived well by Canadian markets and they had limited impact on investment. A possible explanation is that Canadian investors feared the positive effects on US investment would attract more investors south of the border which would be detrimental to the Canadian markets which could be seen as a substitute for investment in the U.S.

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<sup>12</sup> Following Sims and Zha (1999), error bands correspond to the 16% and 84% quartiles (68% confidence interval). Results are significant if the confidence intervals do not recover 0.

Consequently, the impact of the *QE* shock on the *GDP* is domestically and internationally positive as expected. These results are in line with the literature (Joyce, Miles, Scott and Vayanos, 2012; Gambacorta, Hofmann and Peersman, 2014). Our results suggest the positive impact of *QE*, particularly for the consumption channel. This finding can be associated with the effect on consumption of the portfolio balance channel (Joyce et al. 2012) and the positive wealth effect generated by quantitative easing (Fratzscher, Lo Duca and Straub, 2018). Our results show that confidence and sentiment indicators often precede the actual response. This finding allows to take into account the short term movements in the economy via confidence and sentiment indicators that vary at a higher frequency. These effects are usually unaccounted for in empirical VAR models, as underscored by Ramay (2011) and therefore contribute in bridging the gap between theoretical and empirical models. Sentiment/confidence indicators show that the signal and the confidence channels play a significant role in the pass-through of the monetary policy to the real sector (Bauer and Rudebusch, 2014; Bhattarai, Eggertsson and Gafarov, 2015).

#### 4.1.2. European shocks – credit easing

Figure 2 present the impulse responses following a *CE* shocks while variance decompositions are reported in Table 2. European credit easing policy had a limited impact on both sentiment/confidence indicators (*LCCIEURO* and *ISEURO*) and on the considered economic indicators. Domestically, the only significant response is related to investment in the short run (*LINVESTEURO*), but the variance decomposition is weak. *CE* does not increase consumption and *GDP* in the Eurozone. The Canadian case is similar with no significant effect associated with a shock in the European monetary policy when the variance decomposition are taken into account. In the USA however, the European monetary policy has a significant and negative impact on U.S investment (*LINVESTUS*). This spillover could be attributed to the reduction of US exports to the Eurozone – which is one of the main commercial partner of the US. Therefore, we conclude that the macroeconomic impact of the European *CE* policy is null or negative at a national and international level. This result is in line with the findings in Peersman (2011) and highlight the ineffectiveness of the credit channel in the last decade (Acharya, Eisert, Eufinger and Hirsch, 2017), even if exceptional measures were implemented in order to stimulate credits in terms of the zero lower bound, large amounts of liquidity provide to the banking system, negative deposit interest rate etc.

## 4.2 Fiscal policies

In this section, we present the impulse responses following a one standard deviation shock in the US and Euro budgetary policies. More precisely, we consider a positive US government expenditures shock, a negative US government revenue shock, a negative government expenditures and a positive government revenue shocks in the European countries. Figures 2 and 3 present the impulse response function while table 2 reports the associated variance decomposition of the SVAR model. Figures 4 and 5 display the Generalized Impulse Response Functions following a one standard deviation shock in the US and European government expenditures and revenue respectively. However, it is important to underline the fact that it is difficult to measure precisely the effect of budgetary policies because certain type of expenditures are more efficient in terms of GDP than others and some substitution or complementary phenomenon between different classes of taxes and spending can occur.

### 4.2.1 Government expenditure

#### a) US increase in government expenditure.

Figure 3 and 7 as well as Table 3 present the impacts of fiscal easing in terms of government spending in the U.S. We first discuss the impacts of the increase in U.S. government spending on consumption and consumer confidence. Domestically, impulse response functions following an increase in government spending in the U.S. show that the shock has an immediate, positive and significant (for both impulse response and variance decomposition) impact on consumer confidence (*LCCIOUS*). Consumption (*LCONSUS*) and GDP (*LGDPUS*) also have positive short term impulse responses after two quarters. At an international level, the impact is also significant and positive on European and Canadian consumer confidence (*LCCICAN* and *LCCIEURO*) and consumption (*LCONSCAN* and *LCONSEURO*) although the variance decompositions for European spillovers are low. Results from the GVAR model concur to those of the SBVAR.

On the investment side, there is no effect on investors' sentiment (*ISUS*) and on US investment (*LINVESTUS*) and we find no international spillovers. Our results using the GVAR models support this conclusion and suggest almost no international spillovers. The exception are a positive response for investors' sentiment for Deutschland and France, the main European trade partners of the US, which also translates into a positive impact on GDP in France. Netherlands has positive spillovers on investment and GDP as well.

Based on this evidence, we conclude that an increase in U.S. expenditure has a positive effect on the domestic variables. This effect is mostly channelled through consumption. This conclusion builds on the literature documenting the Keynesian argument that increased government spending have a positive effect on demand, particularly during economic meltdown (Christiano, Eichenbaum, Rebelo, 2011; Woodford, 2011; Auerbach and Gorodnichenko, 2012a; Baum, Poplawski-Ribeiro and Weber, 2012; Auerbach and Gorodnichenko, 2017) at zero lower bound (Romer and Romer, 2008; Eggertson, 2010). Moreover, our results further highlight the role played by consumer confidence in the pass-through of these measures to the real sector. At an international level, there is positive spillovers on consumption and consumer confidence also anticipates the positive real effects of the measure (Blagrave et al., 2017). Again, these effects are stronger in Canada than in Europe in terms of the variance decomposition. The investment side reacts less to government spending, a finding that is also well perceived anticipated with investors' sentiment metrics.

*b) Europe decrease in government expenditure*

Figures 4 and 8 as well as Table 3 present the impulse responses following a decrease in European government expenditures. The results show negative short term impacts on European consumer confidence (*LCCIEURO*) and on European GDP (*LGDPEURO*) as well a lasting impact on European consumption (*LCONSEURO*). The low associated variance decompositions can be explained by the heterogeneity across the Eurozone. The GVAR model allows to further disaggregate these results. Results from Figure 8 show that consumer sentiments react immediately and in the short term in several European countries to budget consolidation. The negative reaction on consumer confidence is matched with a similar reaction on consumption which decreases in several countries in our sample, often the one with the largest debt. The effect on GDP is negative in the year following the reduction in government spending. Strikingly however, Ireland which had a dramatic budgetary deficit (more than 30% of GDP in 2010) has benefited from the measures implemented in favour of the government budget equilibrium that had a positive effect on GDP. At an international level, the impact is also negative during the first quarter following the shock on consumption (*LCONSUS* and *LCONSCAN*) with a variance decomposition more important in US than in Canada due to the importance of trade links between the countries and on US GDP (*LGDPUUS*). The GVAR models confirm these findings. Consumer sentiments

(*LCCIOUS* and *LCCICAN*) react in the opposite direction following European budget consolidation, which suggest perhaps that these measures were originally well perceived by foreign consumers.

European decrease in government spending has low negative domestic impact on investment (*LINVESTEURO*) and investor sentiment (*ISEURO*) following the variance decomposition results. In terms of international spillovers, we document a low negative effect on Canadian and US investment and GDP (*LINVESTCAN*, *LINVESTUS*, *LGDPKAN* and *LGDPUS*). Most variance decompositions are low, suggesting that although significant, the European decrease in government spending has low spillover effects from the supply side. The GVAR model confirms this low or non-significant impact at the zero lower bound. These findings are in line with the literature that underscores the fact that fiscal consolidation could not be alleviated by expansionary monetary policies in the zero lower bound (Hall, 2009; Christiano, Eichenbaum and Rebelo, 2011 ; Auerbach and Gorodnichenko, 2012a ; Batini, Callegari and Melina, 2012 ; Corsetti, Meier and Müller, 2012; Blanchard and Leigh, 2013).

Our results shed new light on the issue as we provide detailed results on international spillovers and on the regional reactions in Europe. We also contribute by investigating confidence and sentiment indicators. In fact, our results suggest that the European decrease in government spending during the debt crisis and in a zero lower bound context has a negative impact on consumer confidence as well as on consumption both domestically and internationally. At a regional level, the existing literature documents that the adverse effect on consumption and confidence in each European country is exacerbated by the decrease in demand in the other countries of the zone (Auerbach and Gorodnichenko, 2012b; Blagrove et al., 2017). Our results further underscore that the negative effects of fiscal consolidation in the long run is more acute in countries with important debt and negative economic growth as described in several related papers (Hall, 2009; Christiano, Eichenbaum and Rebelo, 2011; Auerbach and Gorodnichenko, 2012a; Batini, Callegari and Melina, 2012; Corsetti, Meier and Müller, 2012, and Blanchard and Leigh, 2013). These papers also conclude that stabilization of public finances must be progressive to avoid a decrease in GDP and an increase of unemployment.

Based on these findings for both U.S positive expenditure shock and European negative expenditure shock, we conclude that 1) positive (negative) expenditure shocks have a positive (negative) impact on the economy channelled via consumption, 2) consumer confidence indicators reflect this

finding in the short term particularly in case of an increase in government spending and 3) international spillovers via the consumption channel are in the same direction as in the home country.

#### *4.2.2 Government revenue*

##### *a) US decrease in government revenue*

Results regarding a decrease in government revenue in the U.S can be found in Figure 5 and 9 as well as Table 4. Domestically, decreasing U.S taxes has negative and significant impact on consumer confidence (*LCCISUS*), consumption (*LCONSUS*) and on GDP (*LGDPUS*). Internationally, the impact is the same on consumer sentiment (*LCCIEURO* and *LCCICAN*), consumption (*LCONSEURO* and *LCONSCAN*) and on GDP (*LGDPEURO* and *LGDPKAN*), with significant variance decomposition. These results are confirmed with the GVAR models.

On the investment side, the results suggest a significant negative domestic (*LINVESTUS* and *LGDPUS*) and international impact (*LINVESTCAN*, *LINVESTEURO*, *LGDPKAN* and *LGDPUS*) on investment and GDP, but the reaction of the investors' sentiments (*ISUS*, *ISEURO* and *ISCAN*) is weak or not significant. In terms of international spillovers, the measured effects are more important in Canada than in Europe. These results are confirmed with the GVAR models. They support the macroeconomic evidence presented in Romer and Romer (2008), Eggertson (2010) and Blagrove et al. (2017).

Our evidence suggests that in time of crisis and high government debt, a decrease in taxes is perceived as a bad economic news. It is inefficient to boost the economic activity in terms of consumption or investment. There is no consensus in the literature regarding the real effects of a tax decreases, but Batini, Callegari and Melina (2012) argue that tax cuts in the current period may be perceived as a risk of future tax distortions in particular in countries with a large debt. This explanation is further supported by Canova and Pappa (2006) in the US, in time of balance budget targeting. Finally, the zero lower bound can amplify the negative effects of tax cuts on output (Romer and Romer, 2018; Eggertson, 2010).

##### *b) Europe increase in government revenue*

Figures 6 and 10 as well as Table 4 discuss the results following a positive shock in European government revenue. In the Eurozone, the effects on all macroeconomic indicators (*LCONSEURO*, *LINVESTEURO* and *LGDPEURO*) are positive and significant in the short term. These results are

underscored by the GVAR models. In particular, the positive effects are long lasting in south European countries, the more indebted countries in the Eurozone. While the consumer confidence indicator reacts positively (*LCCIEURO*), the effect on the investors' sentiment (*ISEURO*) is different according to the European countries as shown by the GVAR models. We conclude that fiscal measures through changes in government revenue are more opaque than unconventional monetary policies and fiscal policies affecting government expenses. Our results further document that in terms of fiscal measures, changes in expenditure are more effective than tax changes. Here, our results suggest that it is so because the effectiveness of the signalling channel is not as good for changes in taxes.

Internationally, in the short run, the U.S. consumption channel (*LCONSUS* and *LGDPUS*) reacts positively and similarly to the European markets. In the long run however, the U.S. investment channel reacts negatively to the tax increase in the opposite direction than the European markets. Our argument is that European investments become more attractive and substitute to U.S investments, especially because interest rates were expected to remain low in Europe, boosting investment. There are no significant spillovers to the Canadian consumption channel (the variance decomposition is low), but the investment channel reacts significantly and positively (*ISCAN*, *LINVESTCAN* and *GDPCAN*). Our results are coherent with the explanation in Ilzeztki et al. 2013 and Batini et al. 2014 that an increase in government revenue can generate higher confidence and a reduction in risk premium.

Based on our analysis of tax shocks, we conclude that: 1) the macroeconomic effects of tax reduction in the U.S and tax increase in Europe are opposite to those expected in standard Keynesian theory. This result complements those of Eggertson (2010) by underscoring the importance of the zero lower bound on the effectiveness of a given tax policy. 2) Tax policies don't affect consumer confidence and investors' sentiment in the short term, suggesting the signalling channel is not significant for tax shock. 3) Internationally, spillovers are important through the consumption channel, but limited on the investment channel.

## **5. Conclusions and policy implications discussion**

In this paper, we investigated the impacts of unconventional economic policies on sentiment and confidence indicators and on macroeconomic variables during the last decade. We analyse both the

domestic impacts and the international spillovers of quantitative easing in the US, credit easing in the Eurozone, budget easing in the US and budget consolidation in Europe.

Our results highlight four important conclusions. First, consumer confidence and investor sentiment are good metrics to immediately assess the relevance of shock on unconventional monetary policy as well as fiscal expenditure measures. In particular, consumer confidence is a good forecast of future consumption in the US following a *QE* shock. In Europe, confidence measures were only slightly impacted by credit easing measures, but the actual variable also turned out this way. Therefore, our result suggest that agents understood *QE* better and that this transmission channel has contributed to the success of the policy. *CE* did not send a positive clear signal to agents and was correspondingly less effective. While changes in government expenditure had a similar impact on confidence and sentiment indicators as the real macroeconomic variable, it was not the case for changes in taxes. We conclude that the effect of tax changes are difficult to understand for economic agents. Perhaps because it is difficult to know how they will be implemented in the long term. Consequently, an interesting finding of this paper is that recovery actions (such as *QE* and increase in government spending) are immediately well understood by confidence and sentiment measures enhancing the positive effects on real macroeconomic indicators. Consolidation actions are not immediately and/or correctly understood via confidence and sentiment measures, in particular in highly leveraged countries. Therefore, our analysis suggest that monitoring the effects of consolidation fiscal policies is difficult with the confidence and sentiment indicator considered here. We argue that this is a source of uncertainty that could further disrupt economies. Further interest in fiscal policies should consider how to deliver unconventional fiscal policies decisions in such a way as to be well understood and anticipated by economic agents and how to maximise the effect of the signalling channel.

Second, while our conclusions concerning the positive significant impact of the quantitative easing in the US, channelled through consumption, are in line with both the theoretical and empirical literature, we further document the issue by providing a comprehensive study of the impacts of *CE* in Europe underscoring its ineffectiveness domestically and abroad. Prior to our study, this result was not well-documented internationally. Our results further shed light on the question compared to the literature highlighting the role played by the signal channel, in particular with our results regarding the positive response of consumer confidence.



Third, fiscal policies were heterogeneous during this period and their impacts were consequently different depending on the measure implemented and on the country profile. In a zero lower bound period coupled with a credit freeze of the banking sector, the effect of budgetary policies on investment is low or non-significant. The effect of an increase (decrease) in government expenditures is positive (negative), as expected. This finding is particularly strong in highly leveraged countries going through economic turmoils. Increase (decrease) in taxes has surprising impacts on the economies considered. Economic recovery should be done via government expenditure in order to boost demand. Furthermore, our analysis shed new light on consolidation measure. Our results suggest that consolidation should be undertaken by rising taxes rather decreasing government spending particularly at the zero lower-bound. This was previously undocumented in the literature.

Fourth, when international spillovers were measured they were in the same direction as the domestic effects. International spillovers were particularly important for *QE* measures as well as increase in U.S government spending. The symmetric impacts of the shocks on domestic and international confidence and sentiment measures are an additional evidence to Baker, Wurgler and Yuan (2012) showing that sentiment and confidence spread internationally.

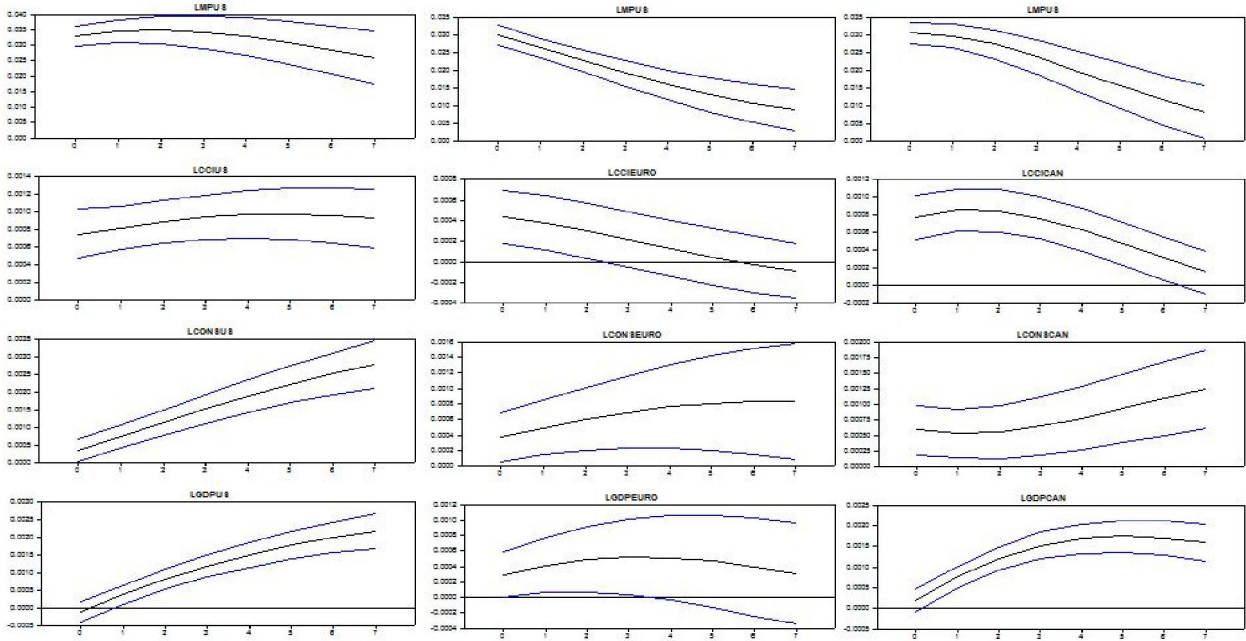
All the evidence presented in this paper suggest that in time of crisis, and zero lower bound interest rate, the more efficient policy mix that may be implemented - in order to recover growth in the short term and converge toward budgetary equilibrium in the long run - should consist of quantitative easing monetary policies coupled, during a first period, with an increase in government expenditures. Once the economic situation is stabilised, consolidation could then be implemented via tax increase. In all economic policies, our results suggest that importance of forward guidance from central banks and government in order to foster confidence. Therefore, as well-understood policy-mix will be more effective and easier to monitor in real-time.

**Figure 1. Impulse responses to U.S quantitative easing shocks**

**U.S**  
**Panel A. Consumption model**

**EUROPE**

**CANADA**



**Panel B Investment model**

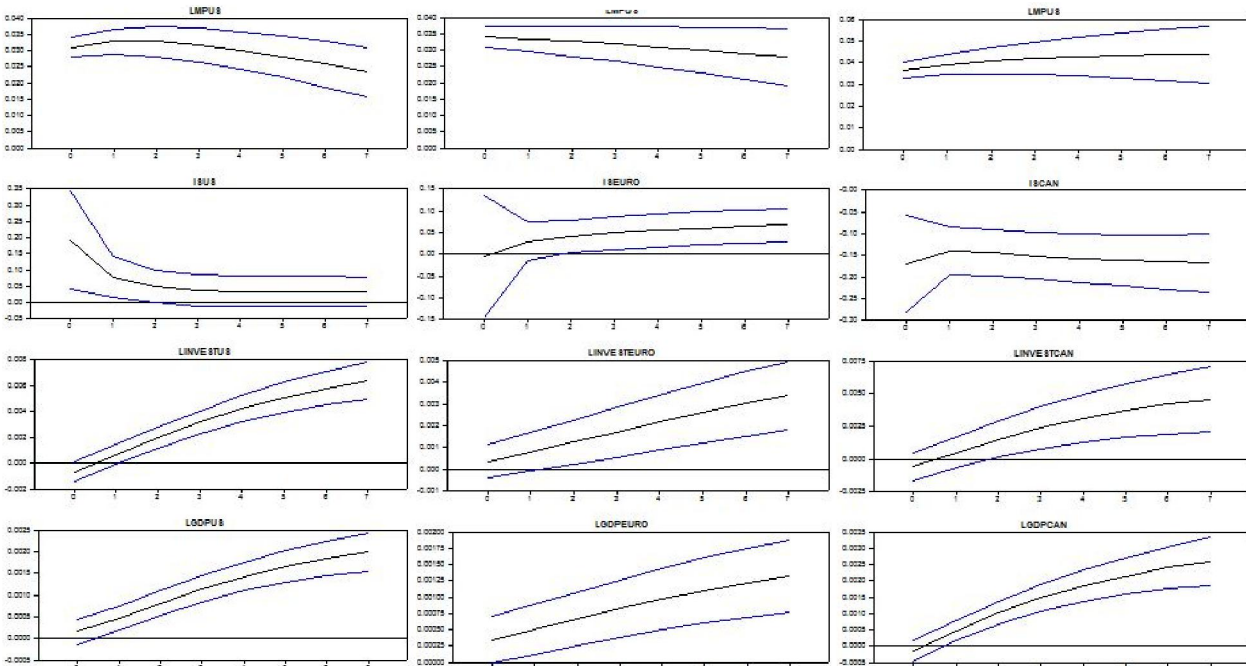
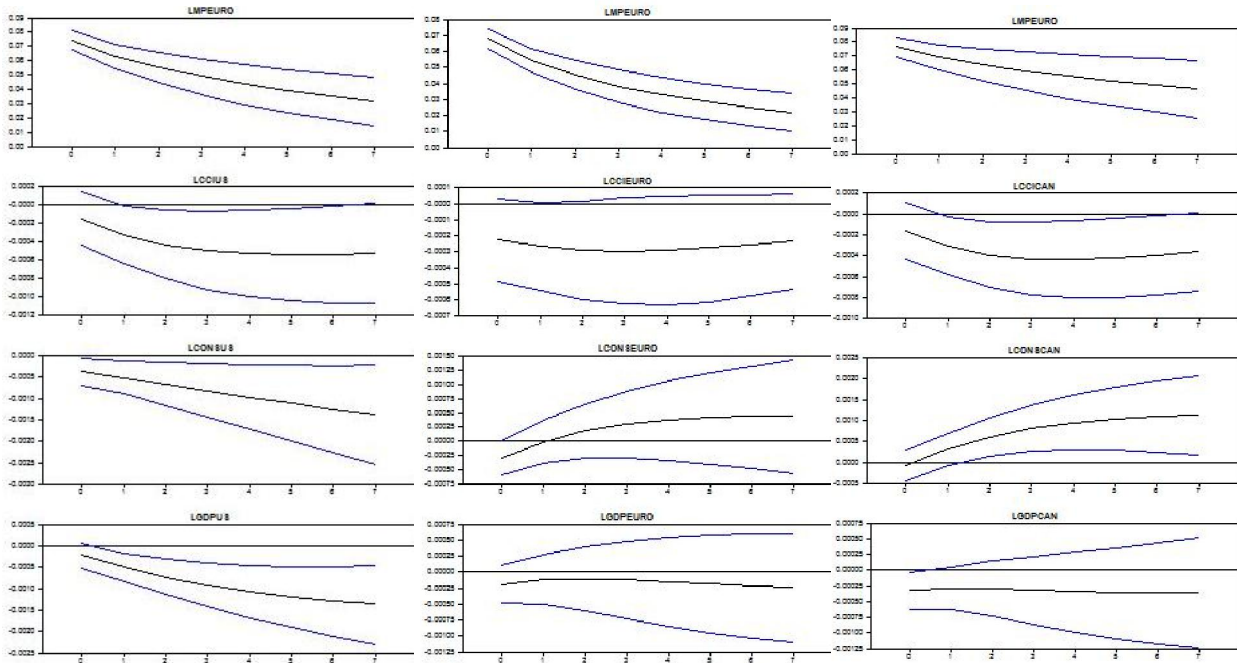


Figure 1. The impulse response functions following a one standard deviation shock in the U.S QE ( $LMPUS$ ). Impulse response functions are obtained from the estimation of eq. (4) and represent the adjustment for each country of the consumption model (Panel a) and the investment model (Panel b) using quarterly data over the 2002-2015 periods. For each country/region (U.S., Europe and Canada) results are displayed in columns and variables are presented in order. The variable order is consumer sentiments ( $LCCI$ ), consumption ( $LCONS$ ) and GDP ( $LGDP$ ) for Panel A and investor sentiments ( $IS$ ), investment ( $LINVEST$ ) and GDP ( $LGDP$ ) for panel B. The response is the solid black line while the associated confidence intervals (Sims and Zha, 1999) are the blue solid lines.

**Figure 2 Impulse responses to European credit easing shocks**  
**Panel B. Consumption model**



**Panel B. Investment model**

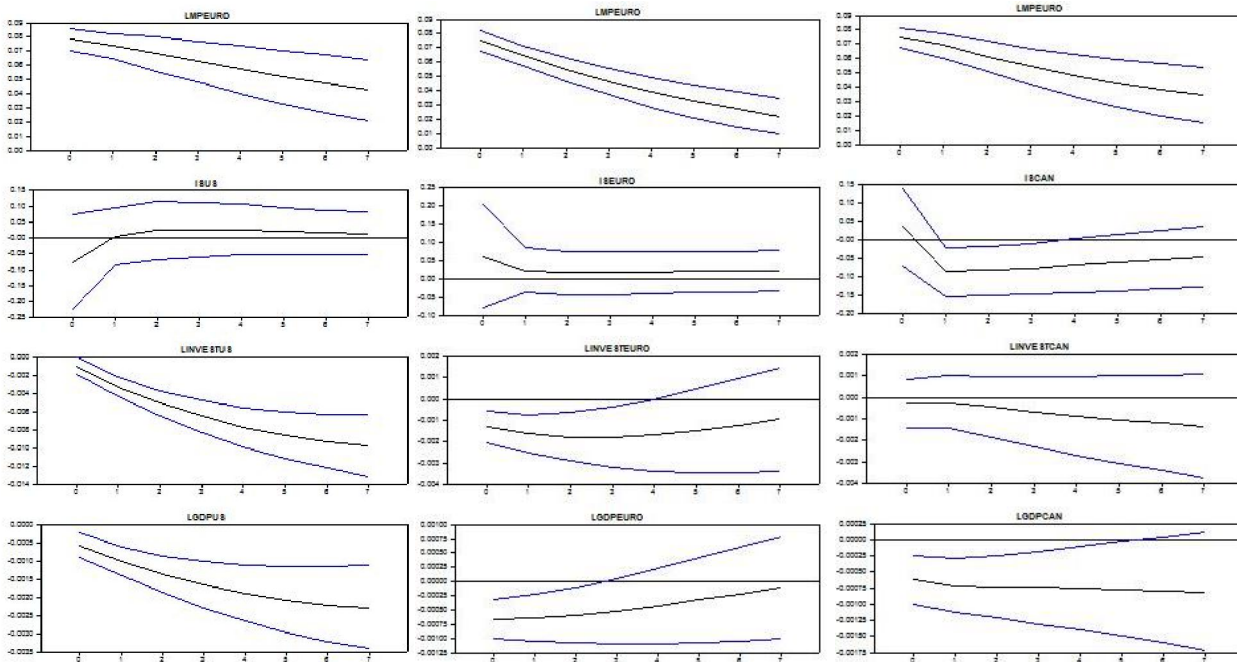
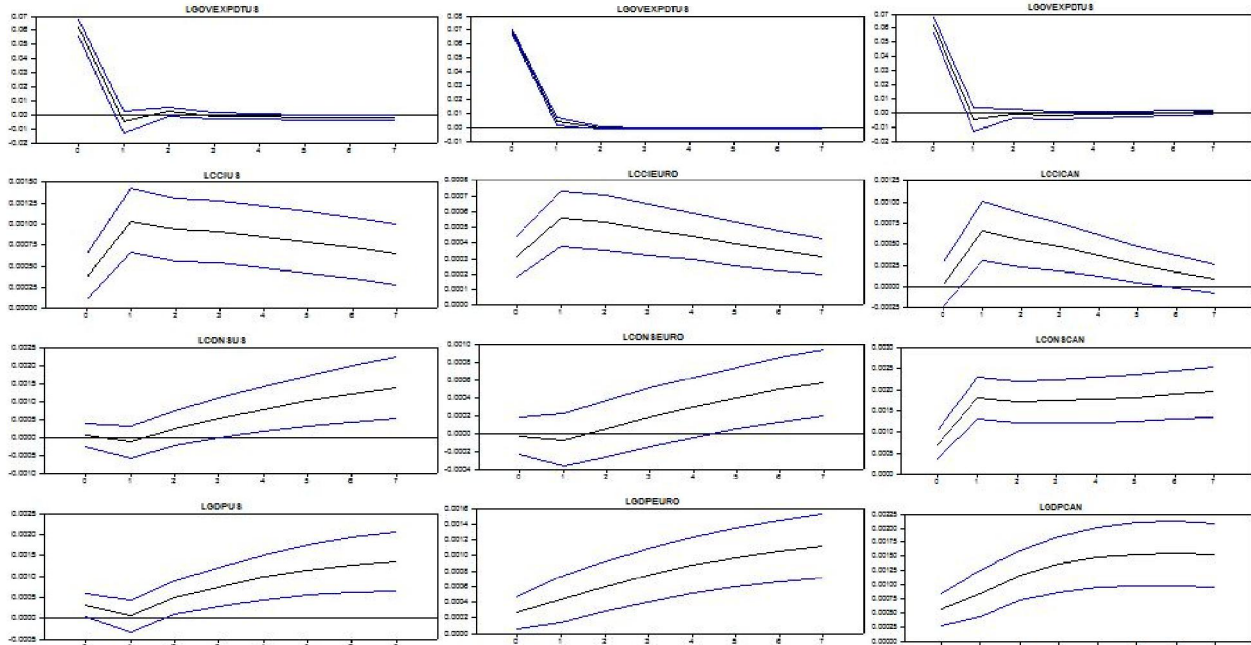


Figure 2. The impulse response functions following a one standard deviation shock in the Europe CE (*LMPEURO*). Impulse response functions are obtained from the estimation of eq. (4) and represent the adjustment for each country of the consumption model (Panel a) and the investment model (Panel b) using quarterly data over the 2002-2015 periods. For each country/region (U.S., Europe and Canada) results are displayed in columns and variables are presented in order. The variable order is consumer sentiments (*LCCI*), consumption (*LCONS*) and GDP (*LGDP*) for Panel A and investor sentiments (*IS*), investment (*LINVEST*) and GDP (*LGDP*) for panel B. The response is the solid black line while the associated confidence intervals (Sims and Zha, 1999) are the blue solid lines

**Figure 3. Impulse response to U.S government expenditures shock**

**Panel a. Consumption models**



**Panel b. Investment models**

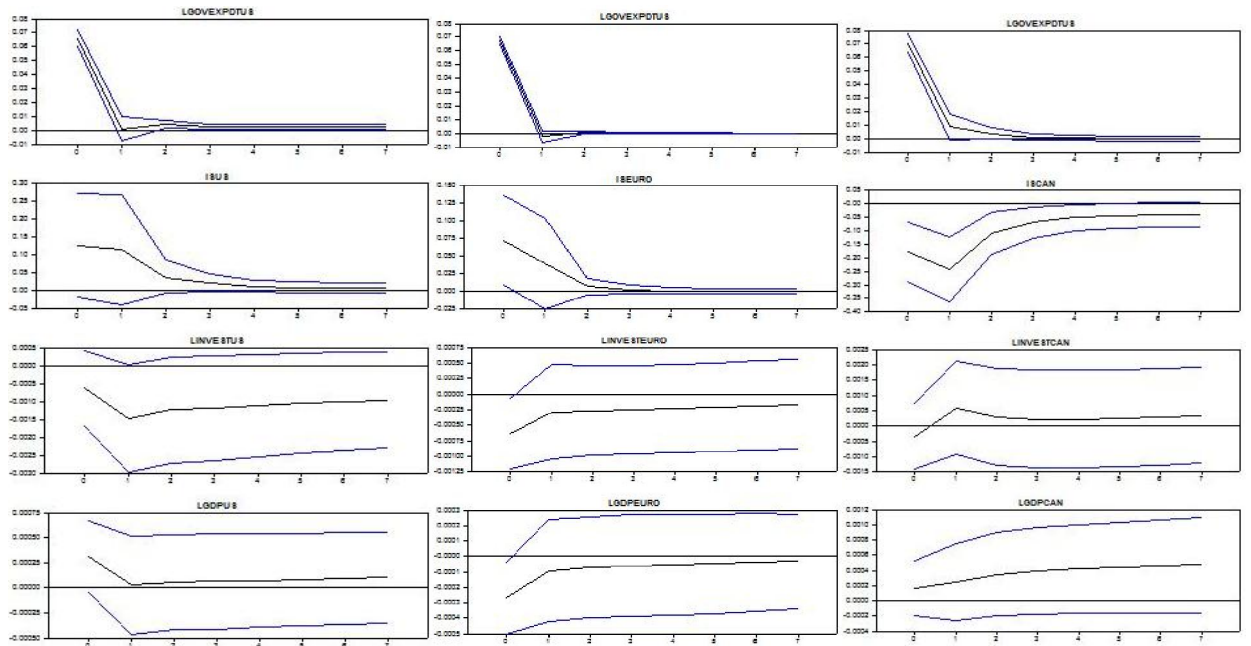


Figure 3. The impulse response functions following a positive shock in the U.S government expenditures ( $LGOVEXPUS$ ). Impulse response functions are obtained from the estimation of eq. (4) and represent the adjustment for each country of the consumption model (Panel a) and the investment model (Panel b) using quarterly data over the 2002-2015 periods. For each country/region (U.S., Europe and Canada) results are displayed in columns. The variable order is consumer sentiments ( $LCCI$ ), consumption ( $LCONS$ ) and GDP ( $LGDP$ ) for Panel A and investor sentiments ( $IS$ ), investment ( $LINVEST$ ) and GDP ( $LGDP$ ) for panel B. The response is the solid black line while the associated confidence intervals (Sims and Zha, 1999) are the blue solid lines.

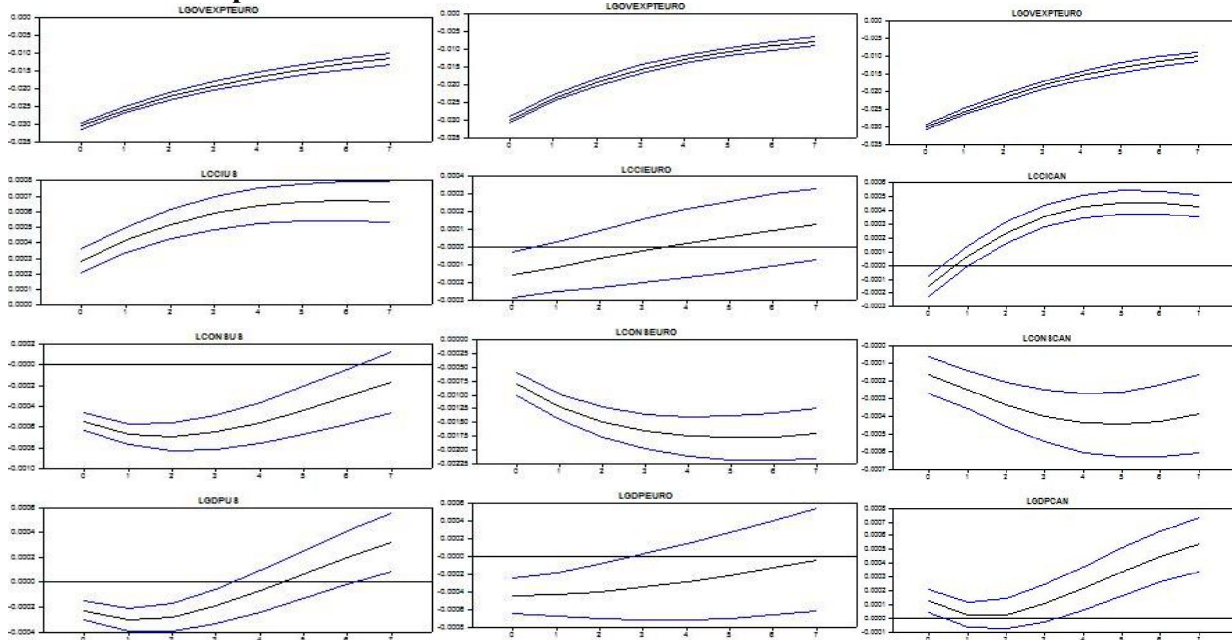
**Figure 4. Impulse response to European government expenditures shock**

**US**

**EURO**

**CAN**

**Panel a. Consumption models**



**Panel B investment models**

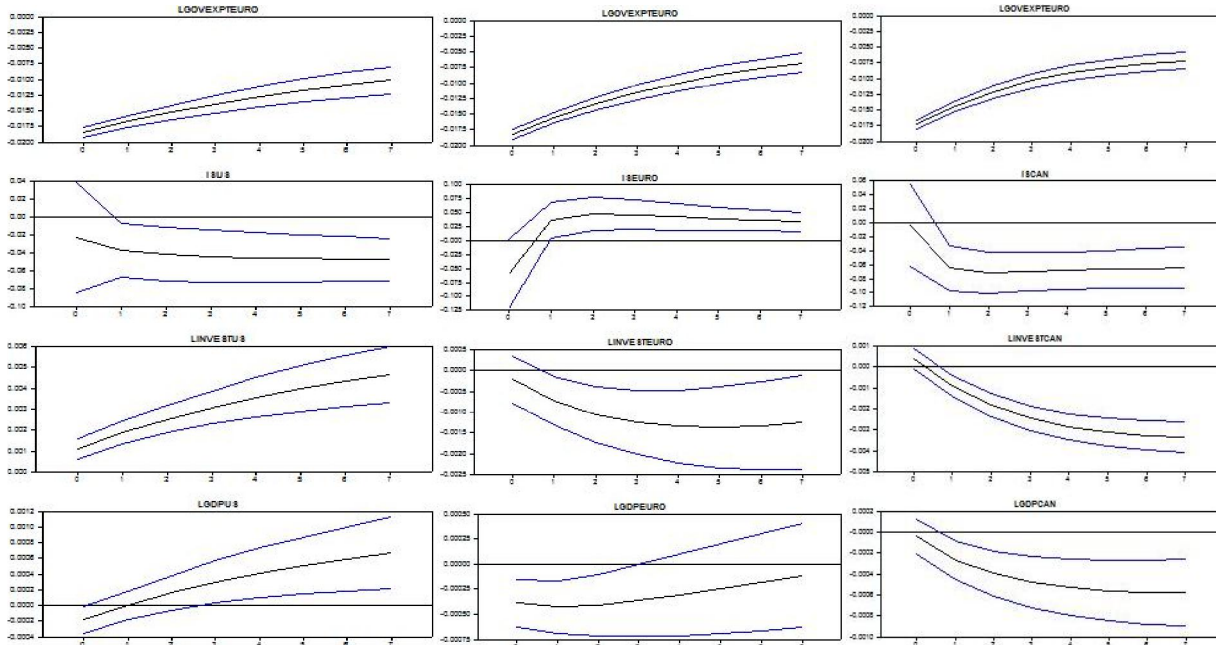


Figure 4. The impulse response functions following a positive shock in the European government expenditures (*LGOVEXPEURO*). Impulse response functions are obtained from the estimation of eq. (4) and represent the adjustment for each country of the consumption model (Panel a) and the investment model (Panel b) using quarterly data over the 2002-2015 periods. For each country/region (U.S., Europe and Canada) results are displayed in columns. The variable order is consumer sentiments (*LCCI*), consumption (*LCONS*) and GDP (*LGDP*) for Panel A and investor sentiments (*IS*), investment (*LINVEST*) and GDP (*LGDP*) for panel B. The response is the solid black line while the associated confidence intervals (Sims and Zha, 1999) are the blue solid lines.

**Figure 5. Impulse responses to U.S. revenues shock**

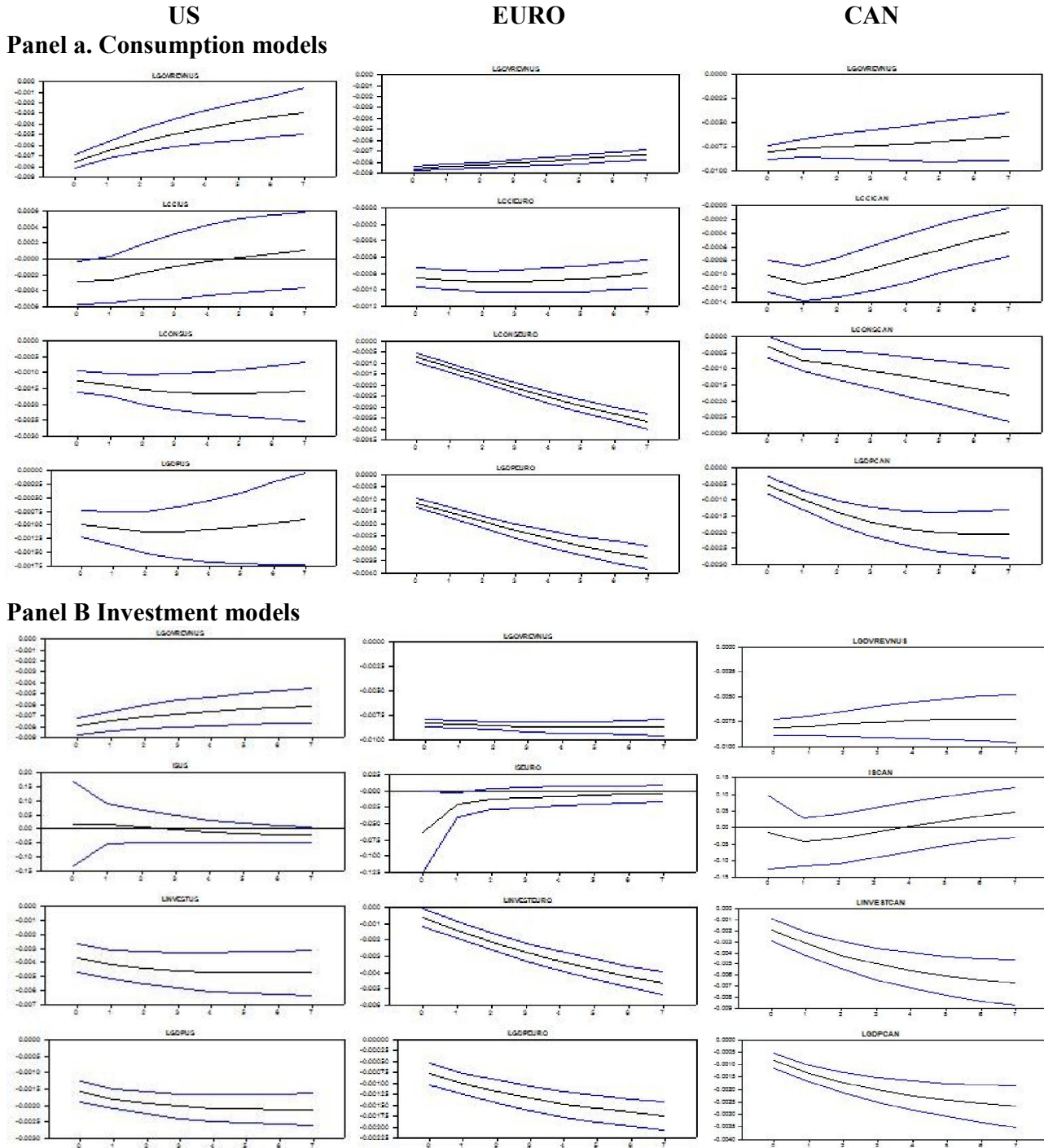


Figure 5. The impulse response functions following a negative shock U.S government revenues ( $LGOVREVNUS$ ). Impulse response functions are obtained from the estimation of eq. (4) and represent the adjustment for each country of the consumption model (Panel a) and the investment model (Panel b) using quarterly data over the 2002-2015 periods. For each country/region (U.S., Europe and Canada) results are displayed in columns and variables are presented in order. The variable order is consumer sentiments ( $LCCI$ ), consumption ( $LCONS$ ) and GDP ( $LGDP$ ) for Panel A and investor sentiments ( $IS$ ), investment ( $LINVEST$ ) and GDP ( $LGDP$ ) for panel B. The response is the solid black line while the associated confidence intervals (Sims and Zha, 1999) are the blue solid lines.

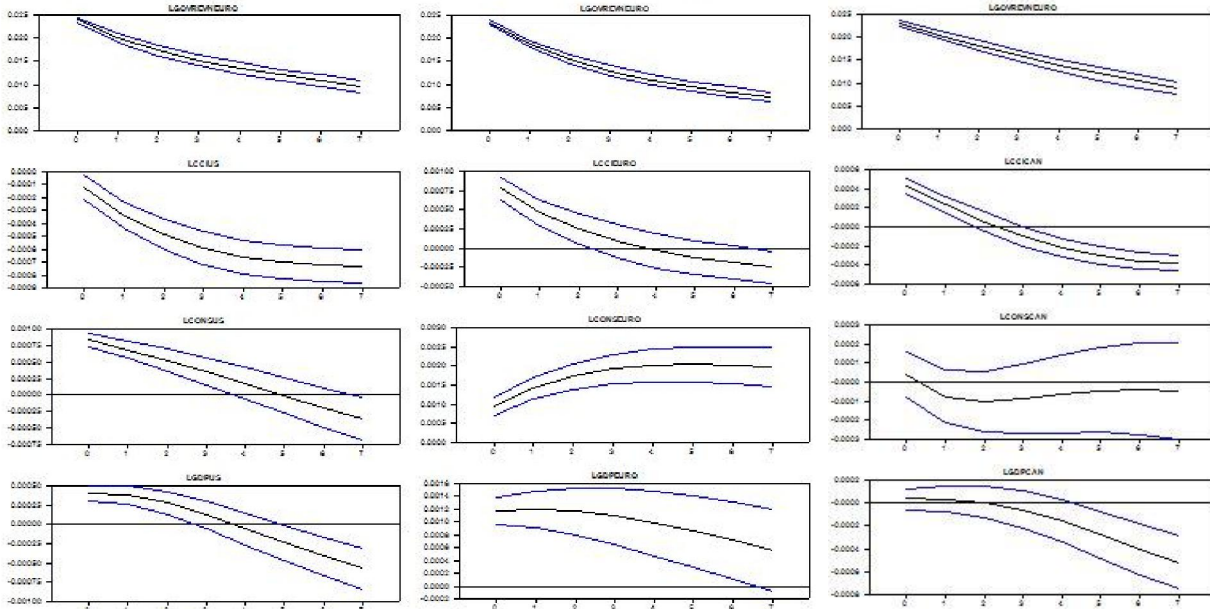
**Figure 6. Impulse responses to European revenues shock**

**US**

**EURO**

**CAN**

**Panel a. Consumption models**



**Panel B Investment models**

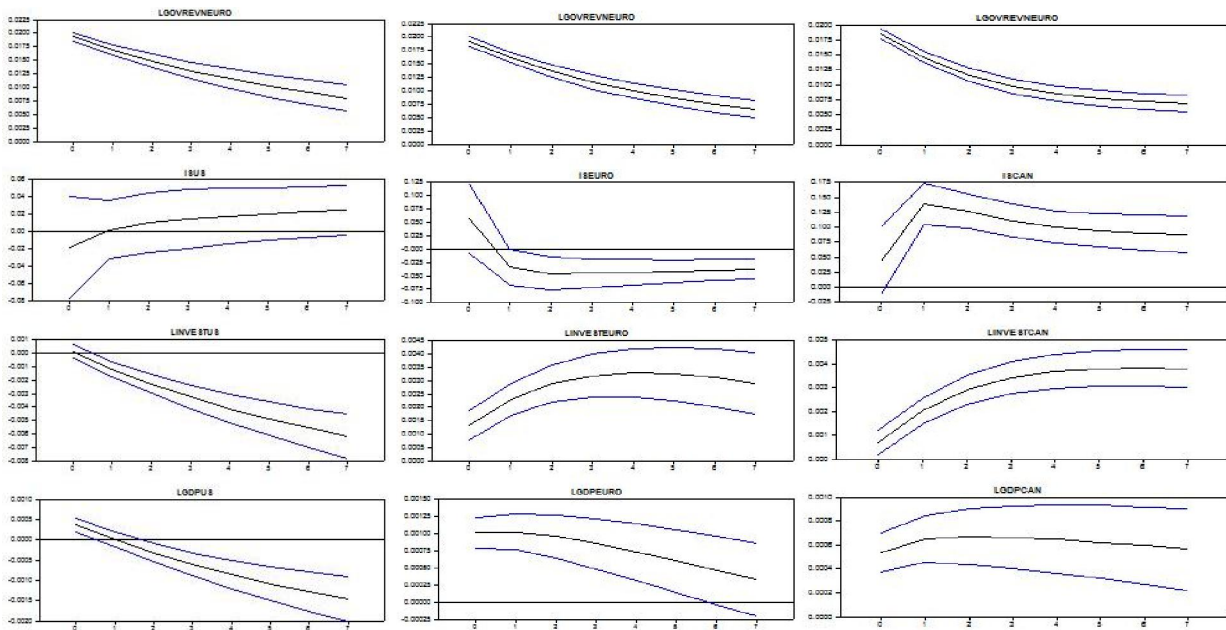
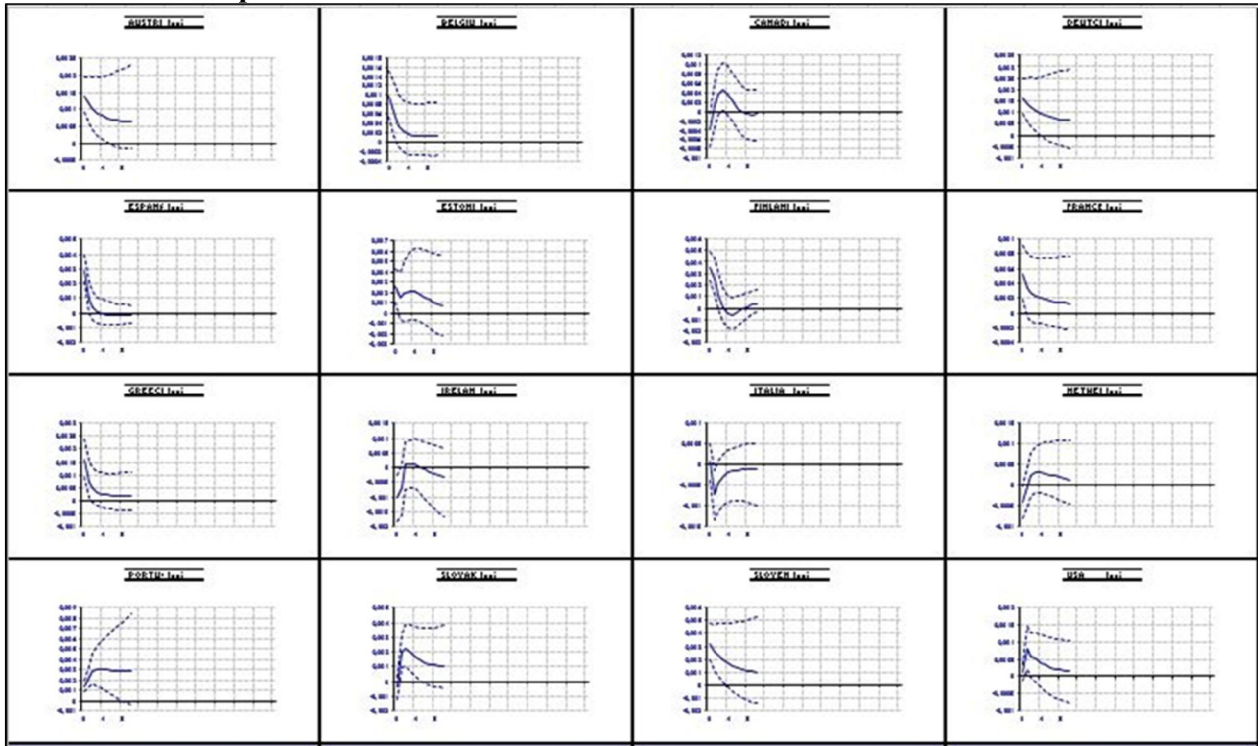


Figure 6. The impulse response functions following a positive shock European government revenue (*LGOVREVNEURO*). Impulse response functions are obtained from the estimation of eq. (4) and represent the adjustment for each country of the consumption model (Panel a) and the investment model (Panel b) using quarterly data over the 2002-2015 periods. For each country/region (U.S., Europe and Canada) results are displayed in columns and variables are presented in order. The variable order is consumer sentiments (*LCCI*), consumption (*LCONS*) and GDP (*LGDP*) for Panel A and investor sentiments (*IS*), investment (*LINVEST*) and GDP (*LGDP*) for panel B. The response is the solid black line while the associated confidence intervals (Sims and Zha, 1999) are the blue solid lines.

Figure 7. Generalized impulse response functions following a positive shock to U.S. government expenditures

Panel A: Consumption model: Consumer Confidence



Panel B: Consumption model: Consumption

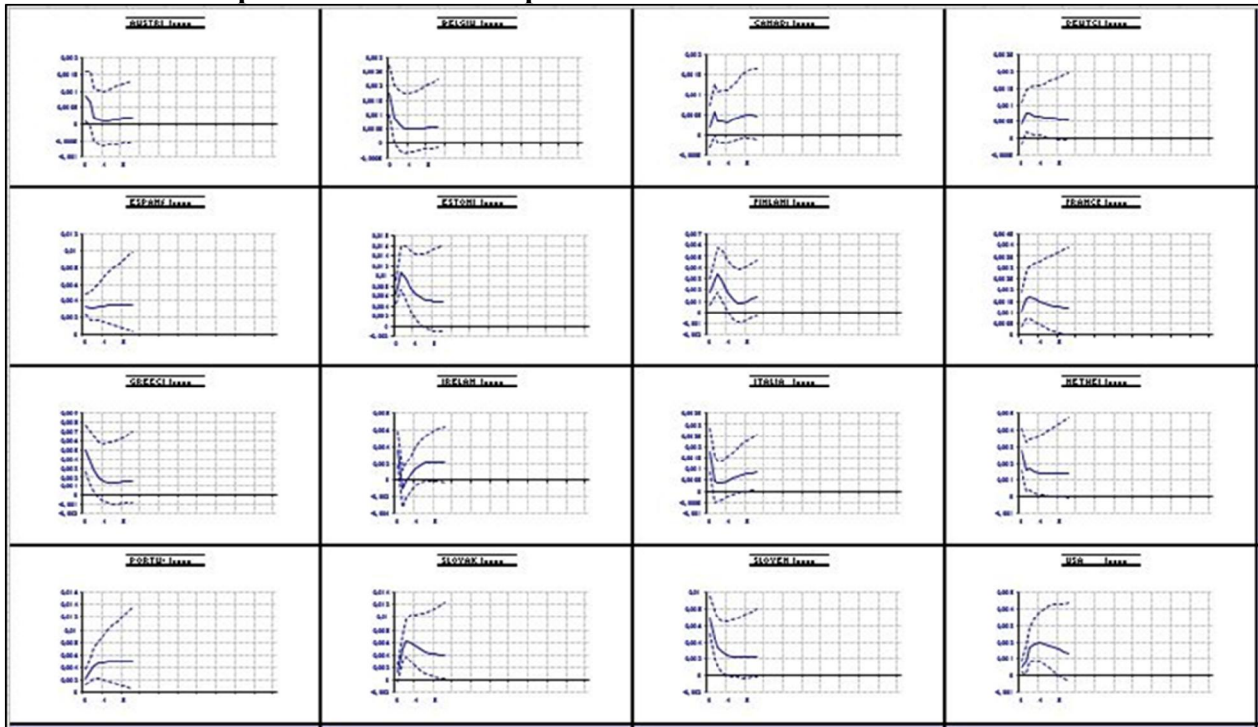
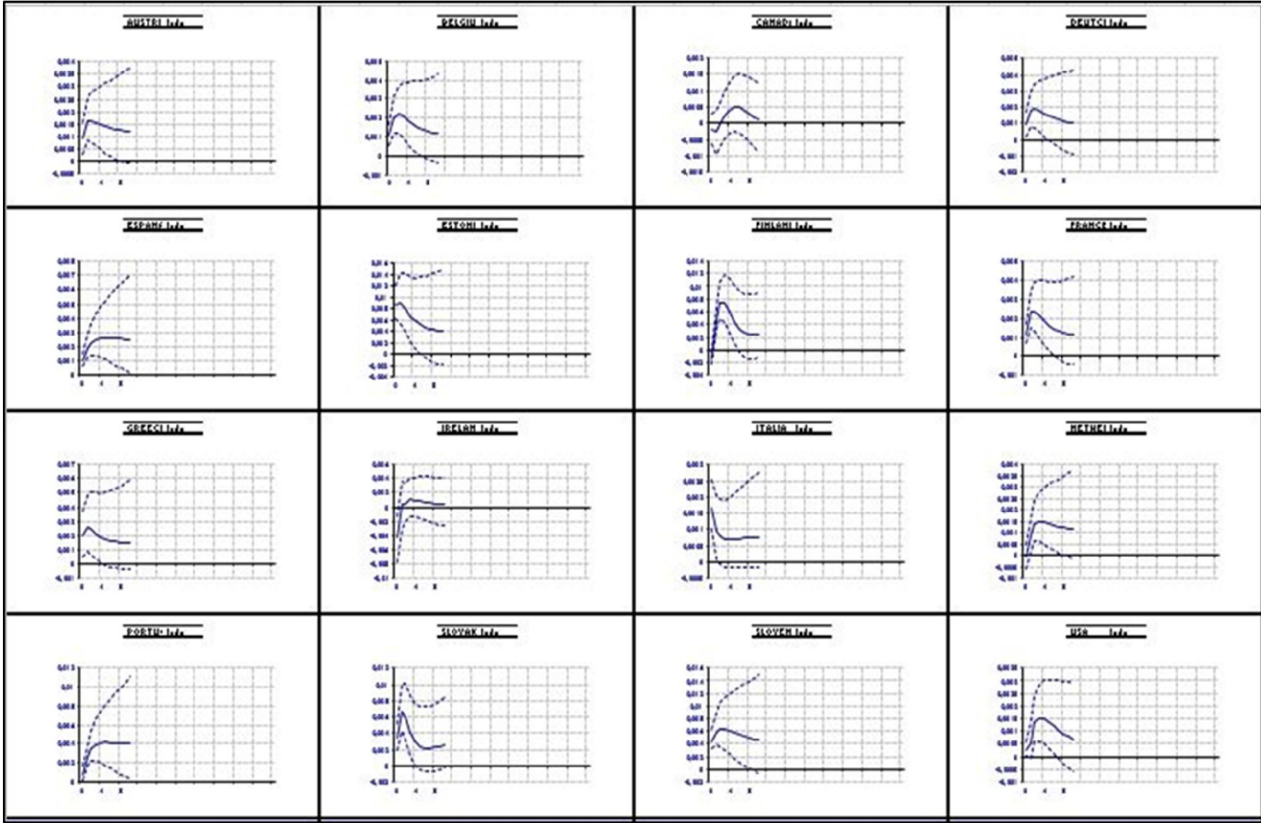


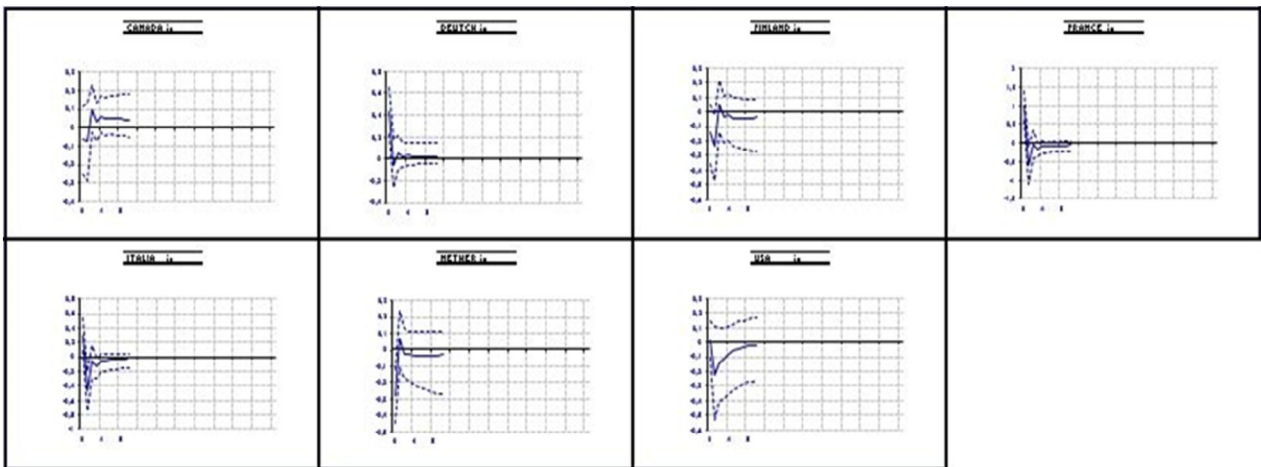


Figure 7 con't

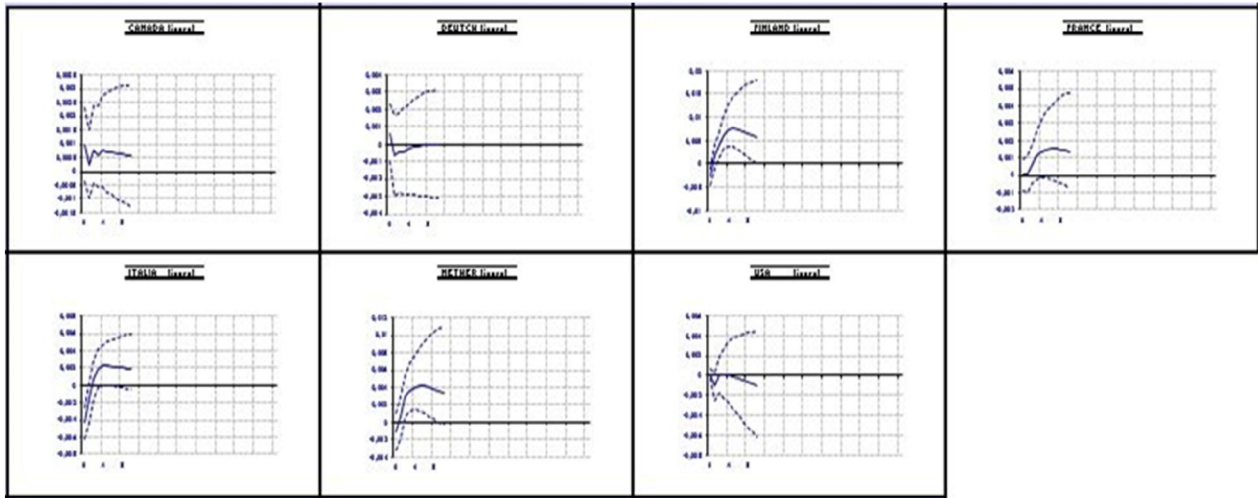
Panel C: Consumption model: GDP



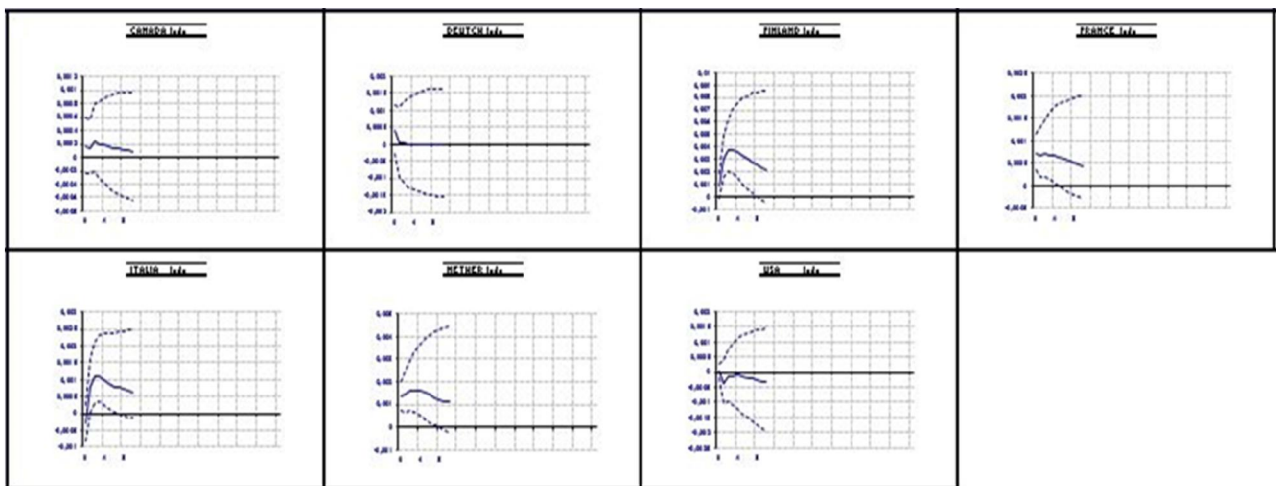
Panel D: Investment model: investors sentiment



**Panel E: Investment model: Investment**



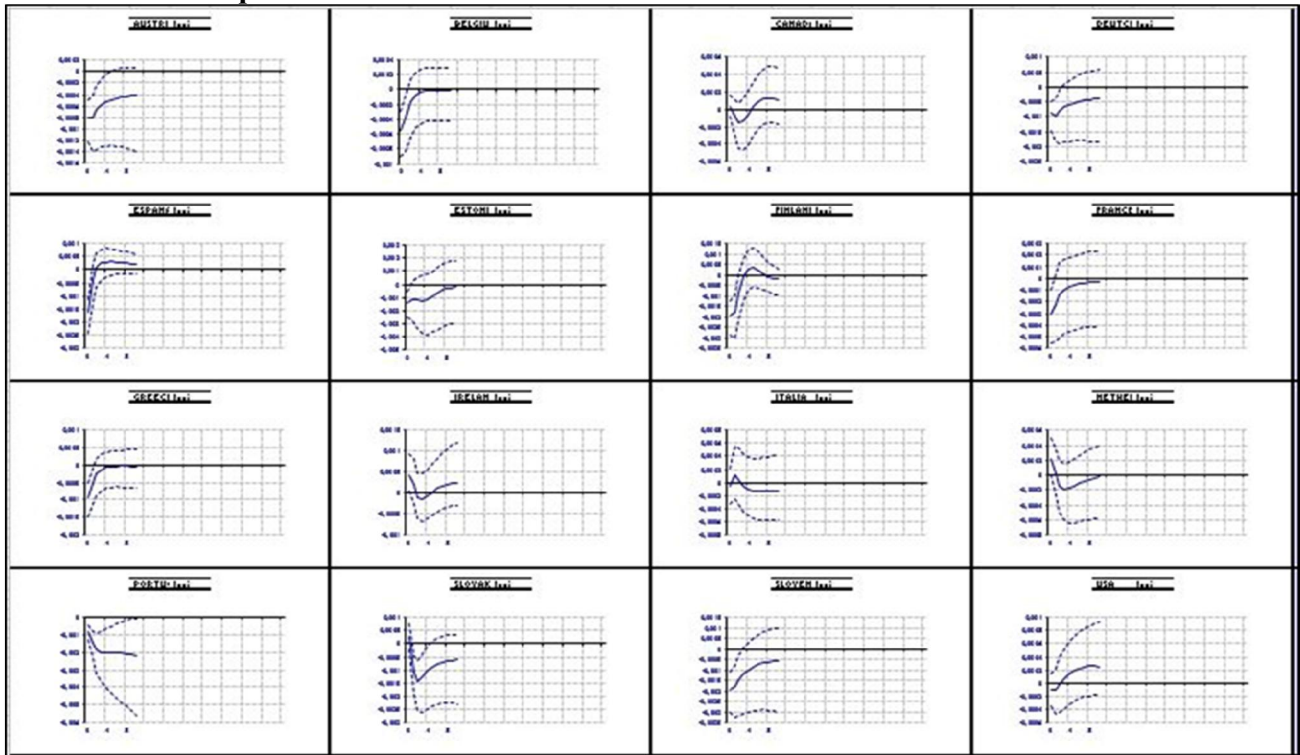
**Panel F: Investment model: GDP**



**Figure 7** reports the GIRFs following a positive shock on U.S government expenditures. GIRFS are obtained following the estimation of the GVAR model presented in eq. (10). The first three panels present the results for the consumption model while the last three panel presents the GIRFS on the investment variables. Each panel present the effect of the shock for each countries' variables. Investment models have less countries because of the limited availability of the investor sentiment variable at the country level. The solid line represent the GIRFS estimates while the dotted lines are the associated confidence intervals.

Figure 8. Generalized impulse response functions following a negative shock to European government expenditures

Panel A: Consumption model: Consumer Confidence



Panel B: Consumption model: Consumption

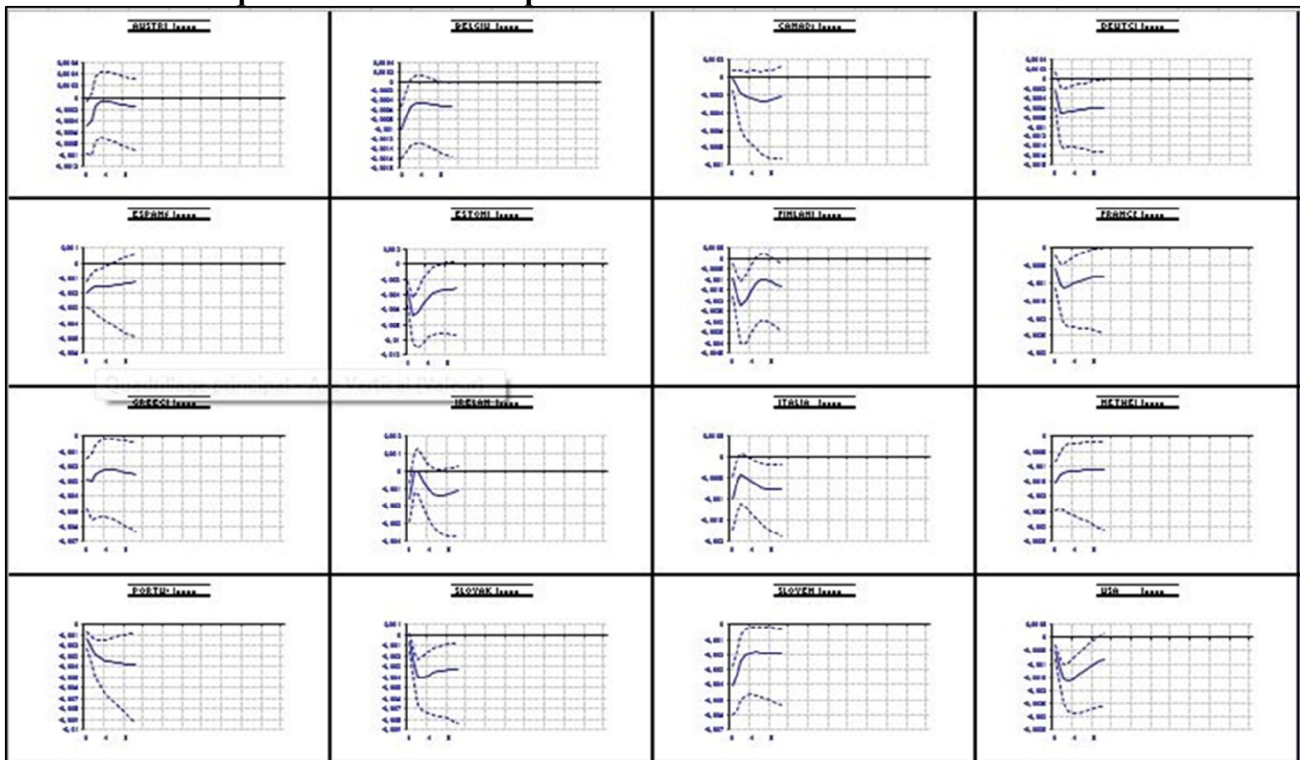
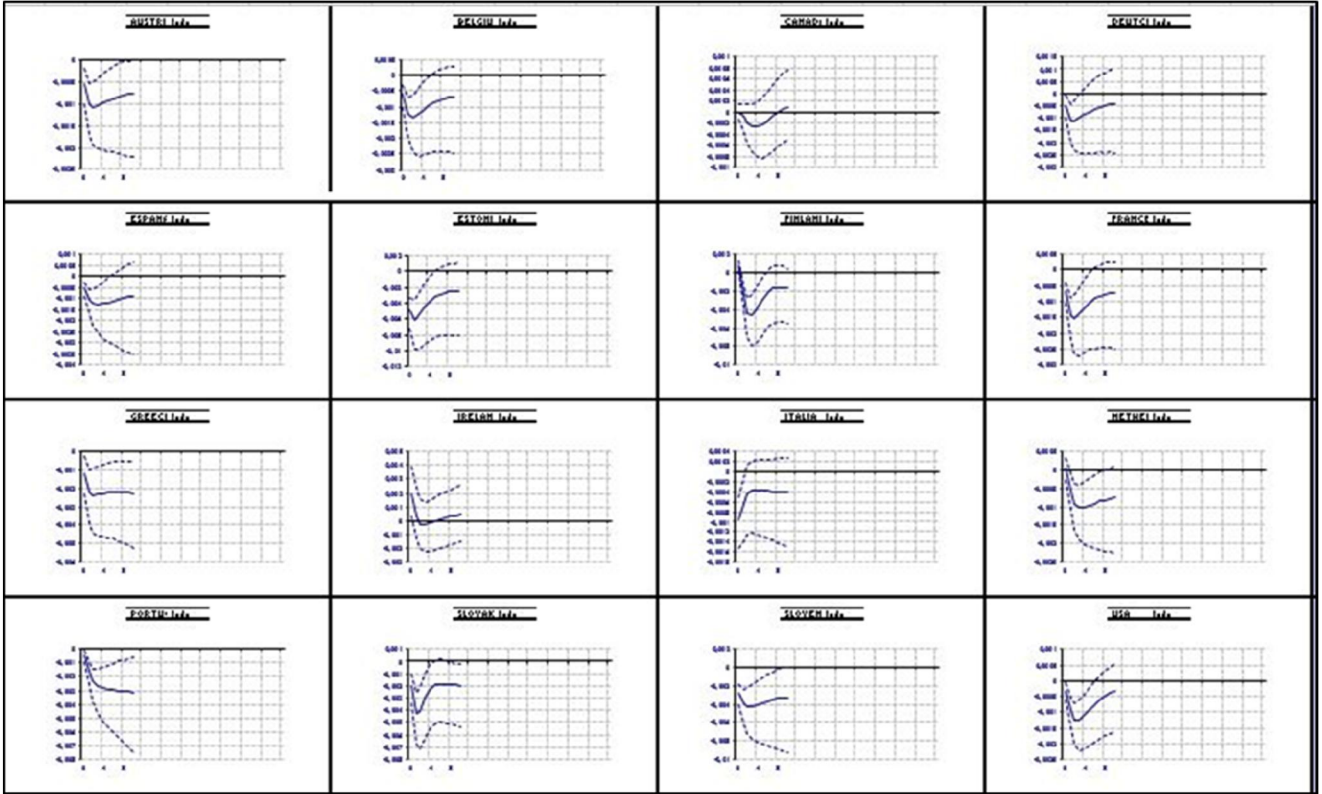
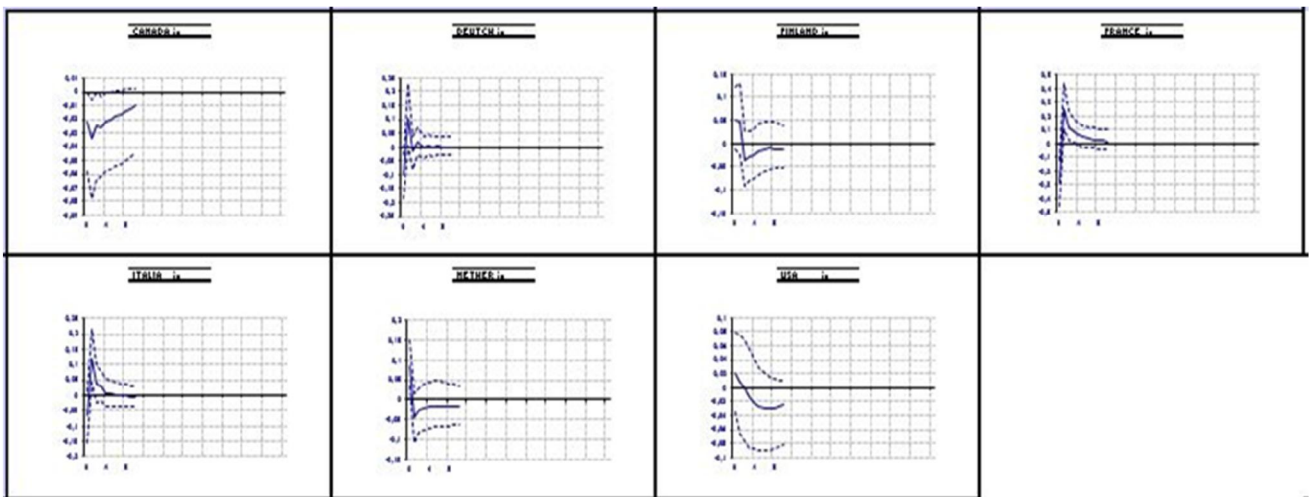


Figure 8 con't

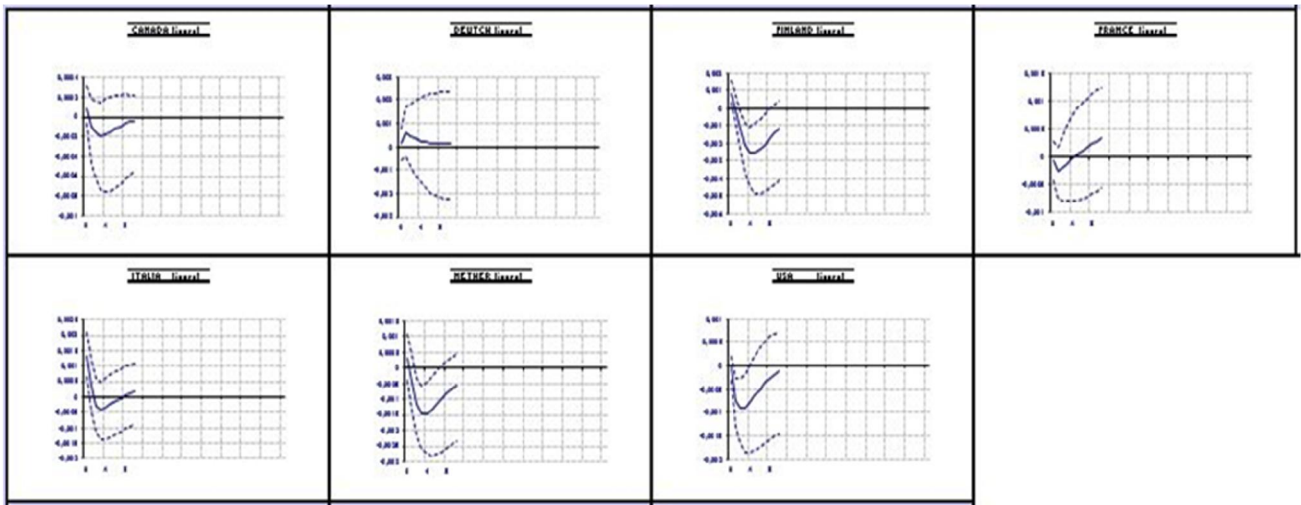
Panel C: Consumption model: GDP



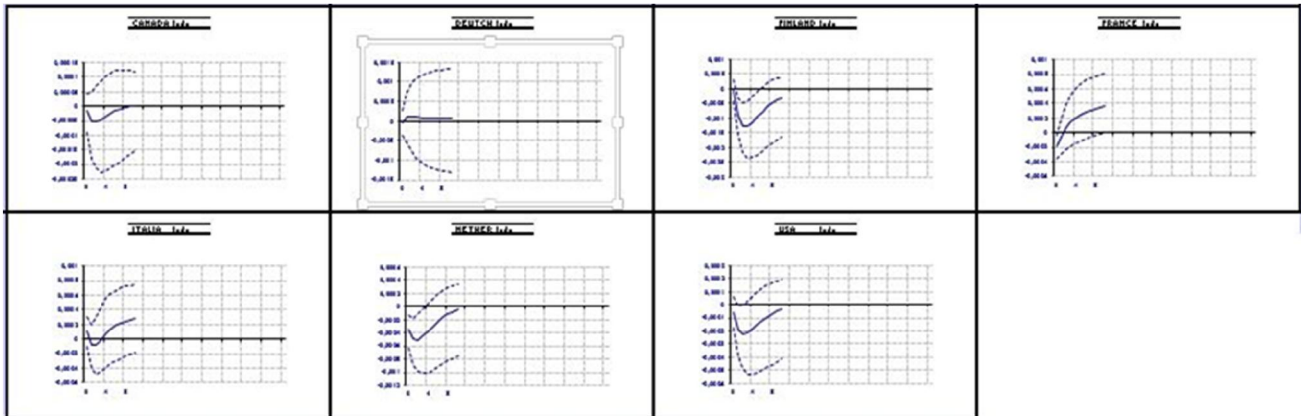
Panel D: Investment model: investors sentiment



**Panel E: Investment model: Investment**

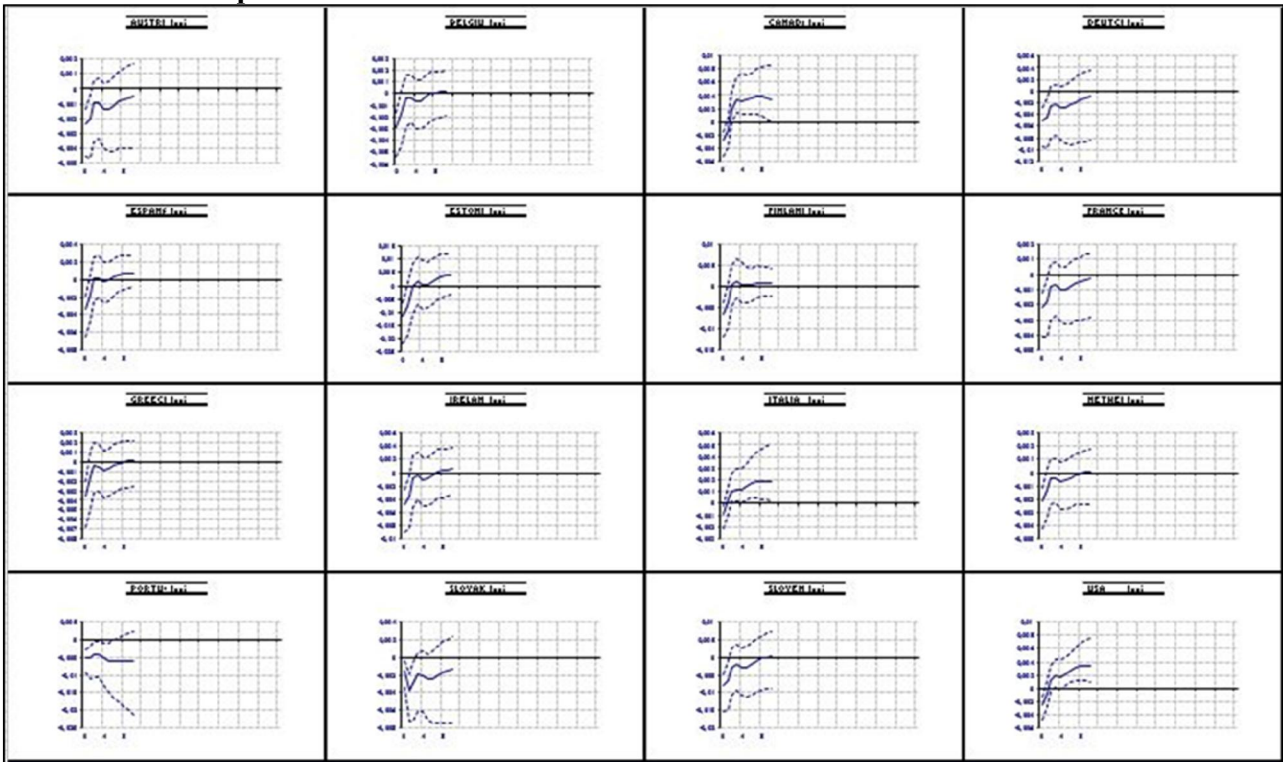


**Panel F: Investment model: GDP**



**Figure 8** reports the GIRFs following a negative shock on European government expenditures. GIRFs are obtained following the estimation of the GVAR model presented in eq. (10). The first three panels present the results for the consumption model while the last three panels present the GIRFs on the investment variables. Each panel presents the effect of the shock for each country. Investment models have less countries because of the limited availability of the investor sentiment variable at the country level. The solid line represents the GIRFs estimates while the dotted lines are the associated confidence intervals.

**Figure 9. Generalized impulse response functions following a negative Shock to U.S. government revenue**  
**Panel A: Consumption model: Consumer Confidence**



**Panel B: Consumption model: Consumption**

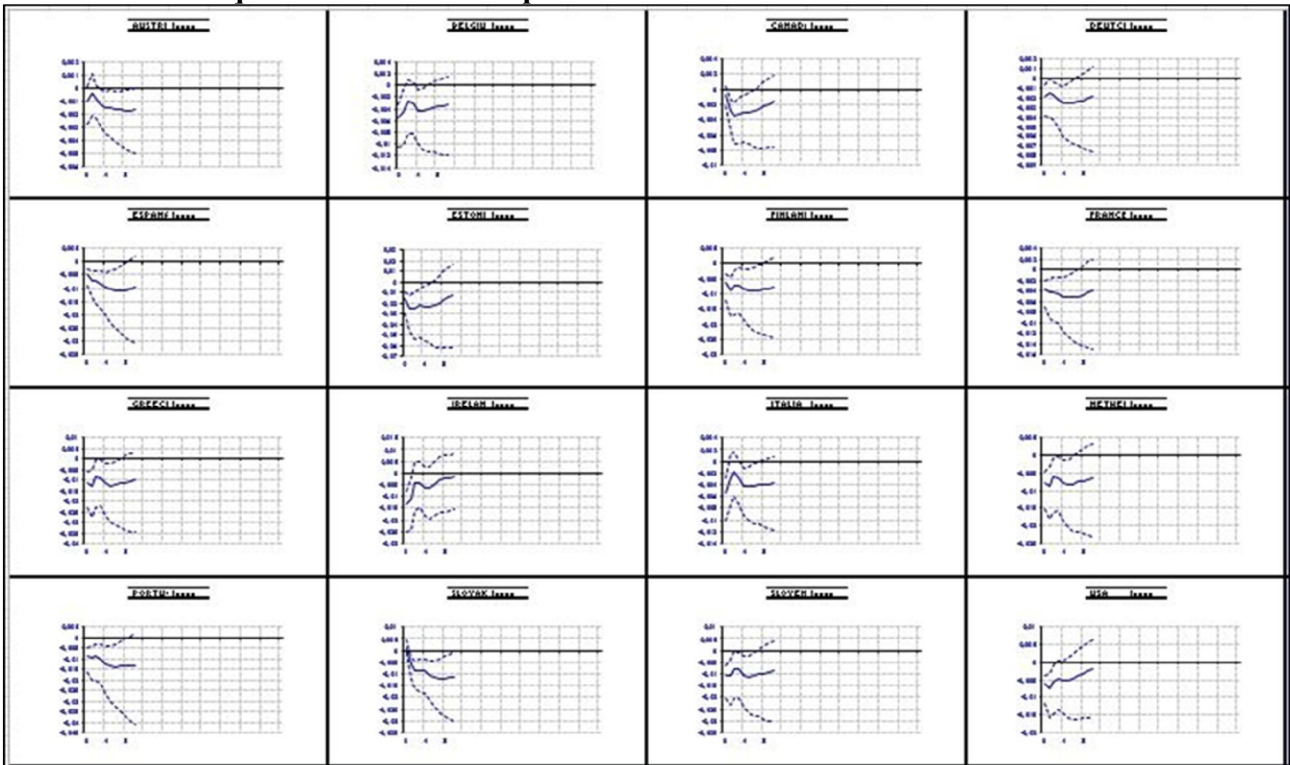
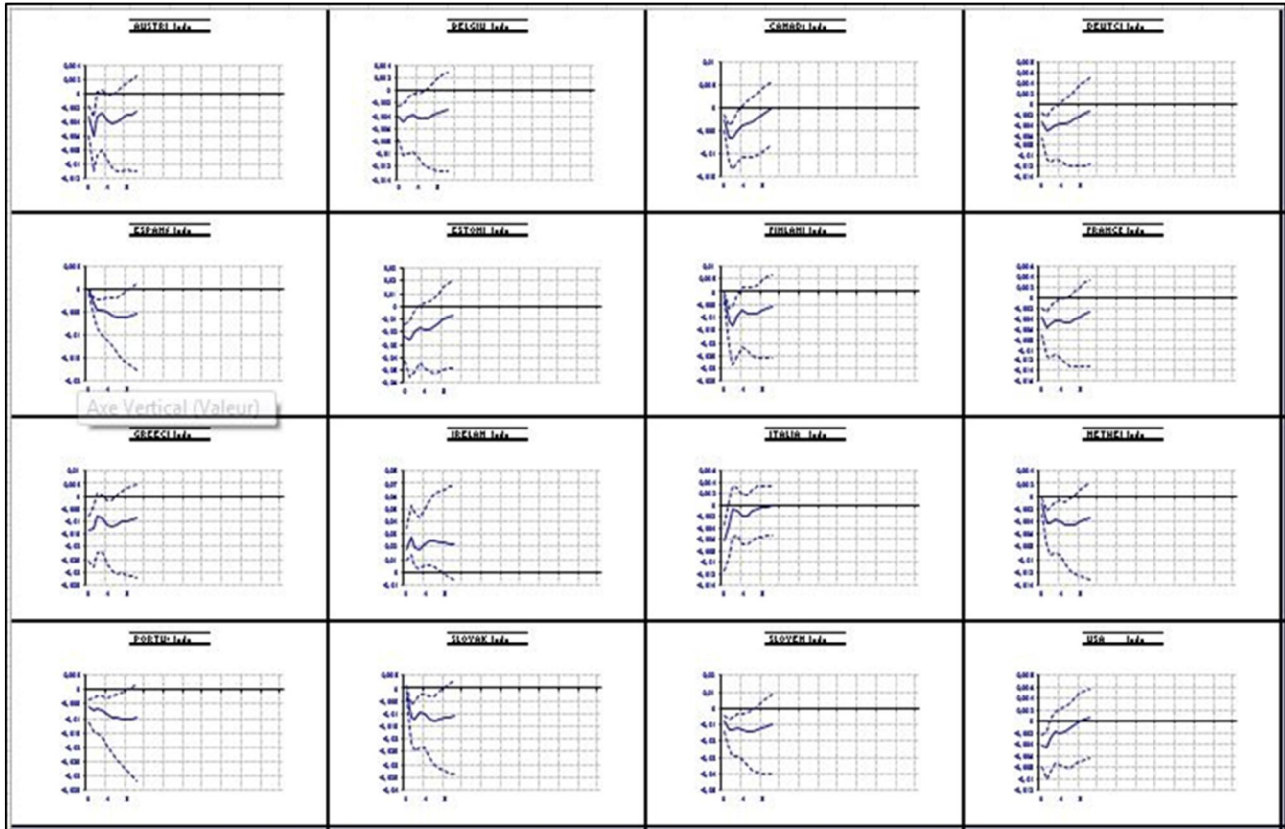
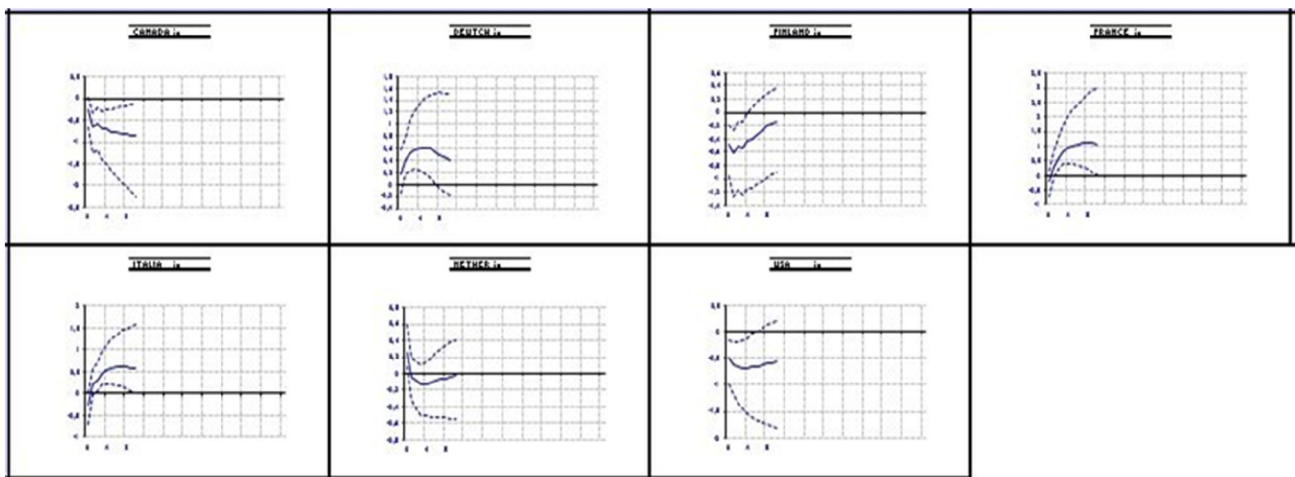


Figure 9 con't

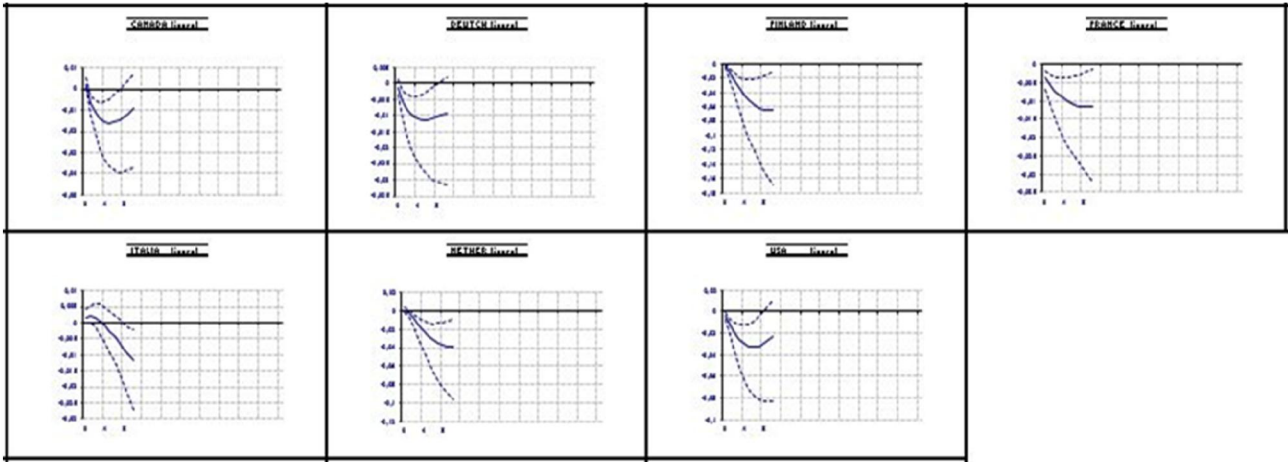
Panel C: Consumption model: GDP



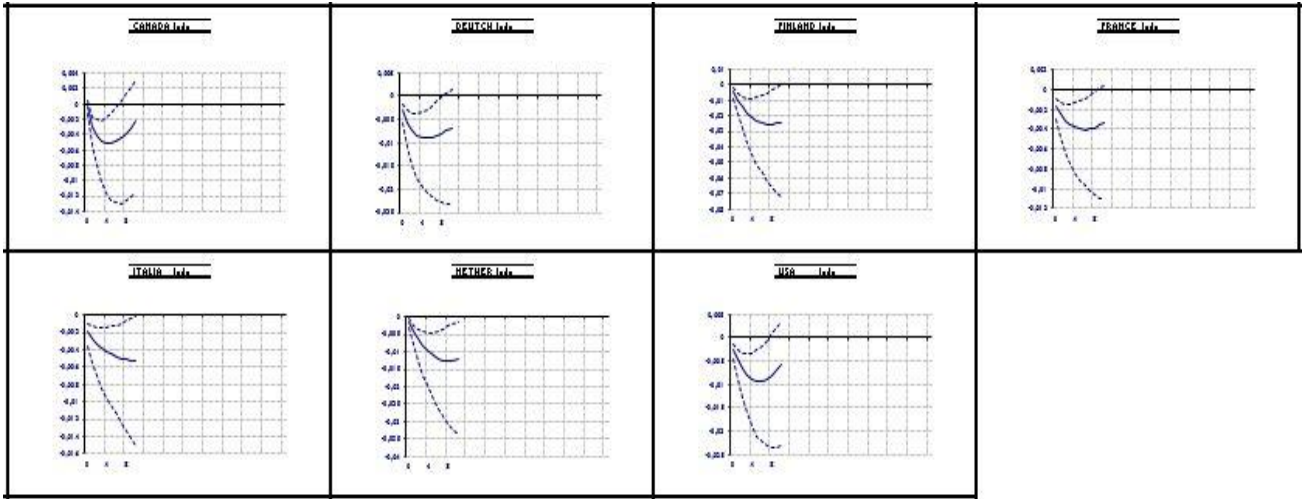
Panel D: Investment model: investors sentiment



**Panel E: Investment model: Investment**



**Panel F: Investment model: GDP**

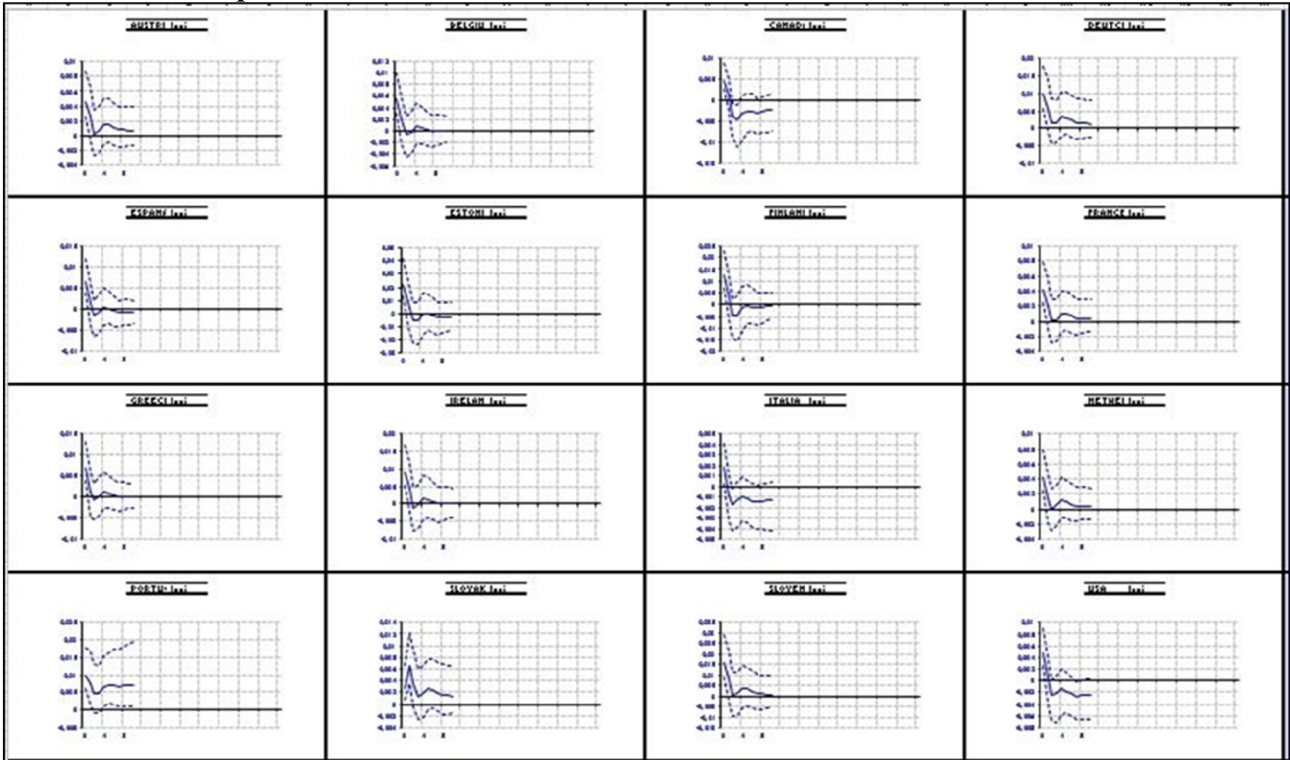


**Figure 9** reports the GIRFs following a negative shock on U.S government revenues. GIRFs are obtained following the estimation of the GVAR model presented in eq. (10). The first three panels present the results for the consumption model while the last three panel presents the GIRFs on the investment variables. Each panel present the effect of the shock for each countries' variables. Investment models have less countries because of the limited availability of the investor sentiment variable at the country level. The solid line represent the GIRFs estimates while the dotted lines are the associated confidence intervals.



Figure 10. Generalized Impulse Response Functions following a shock to European government revenue

Panel A: Consumption model: Consumer Confidence



Panel B: Consumption model: Consumption

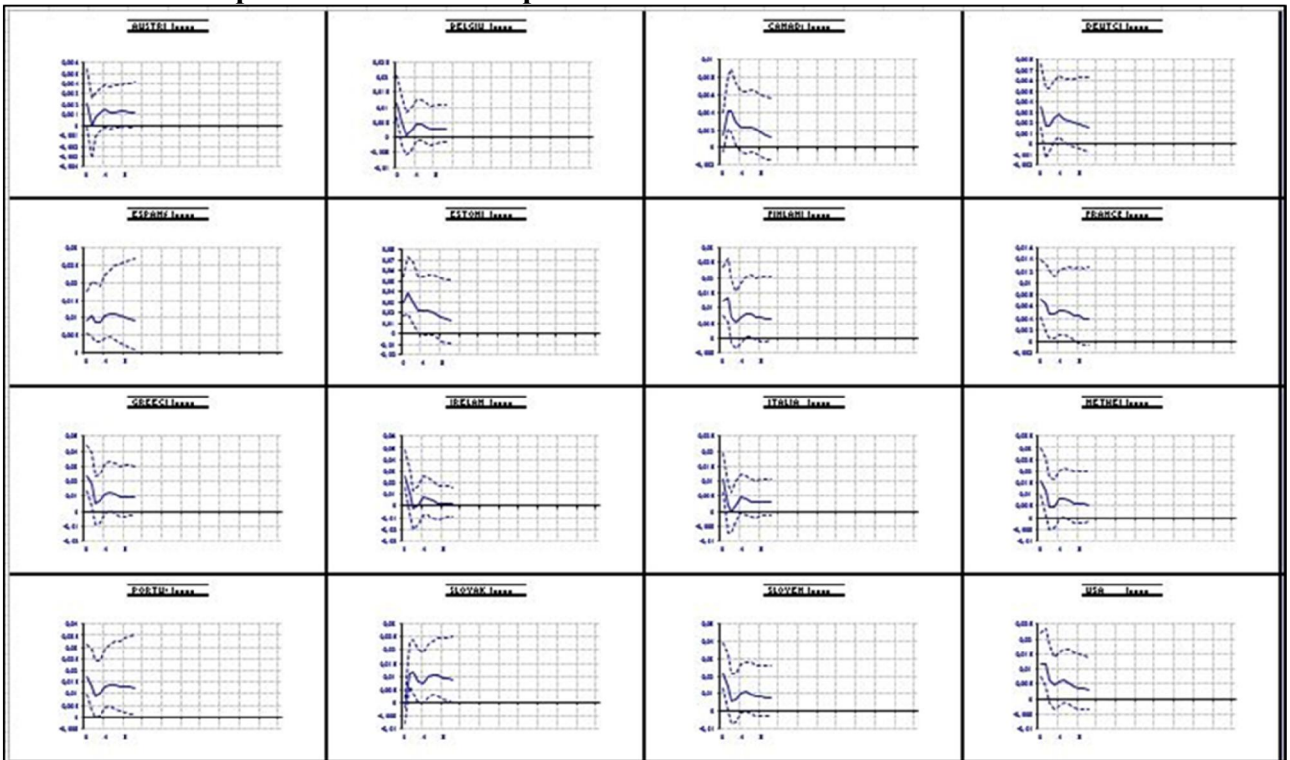
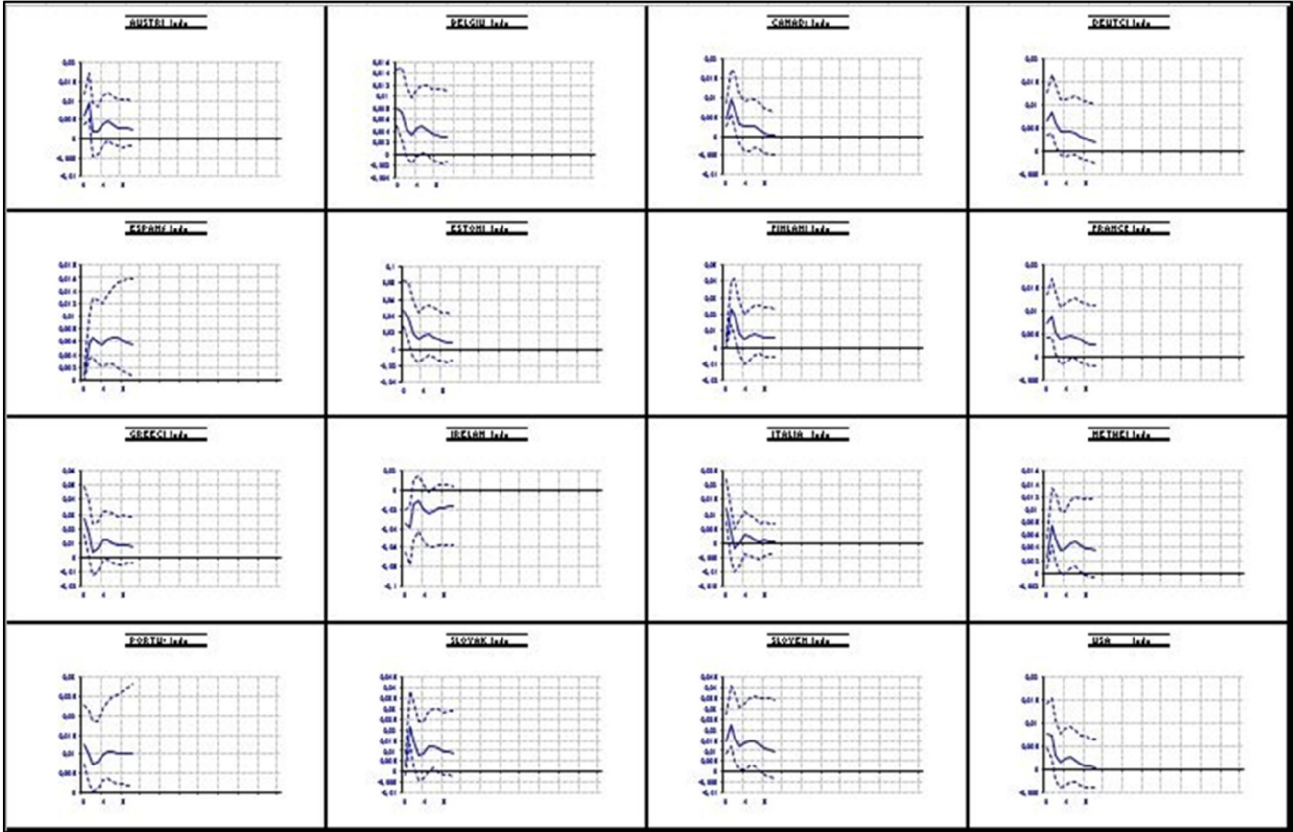
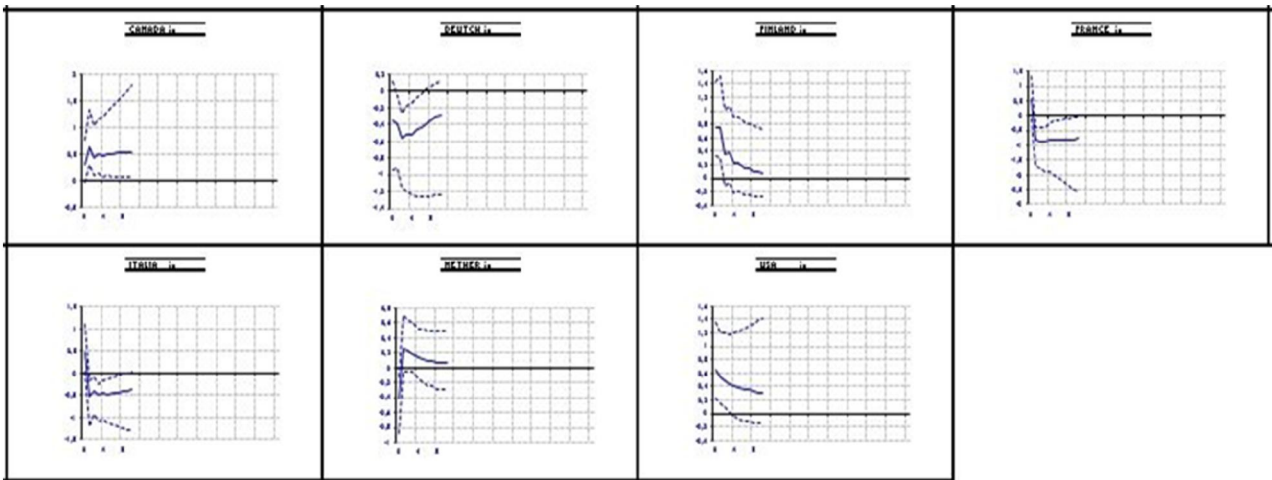


Figure 10 con't

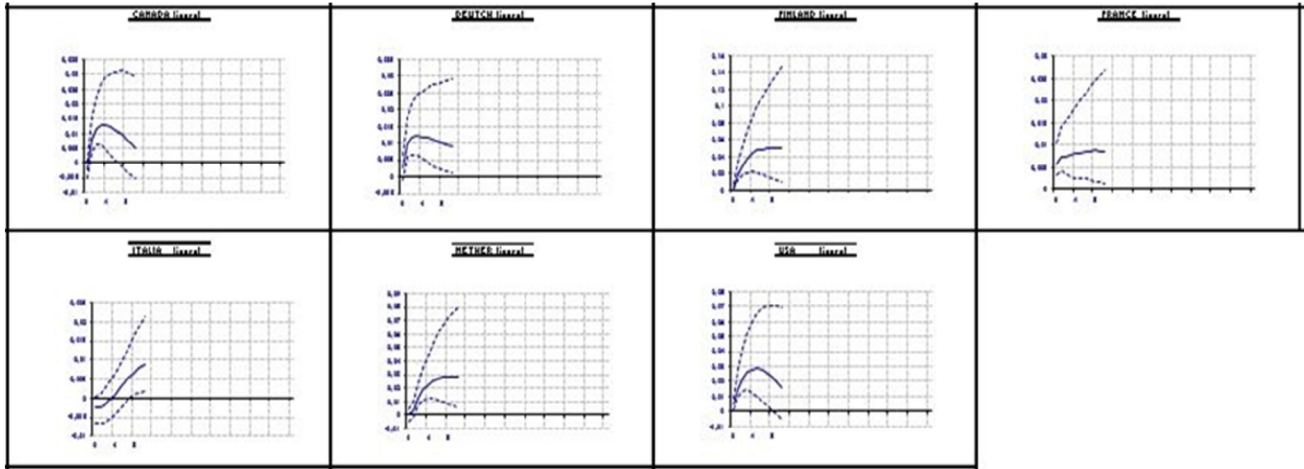
Panel C: Consumption model: GDP



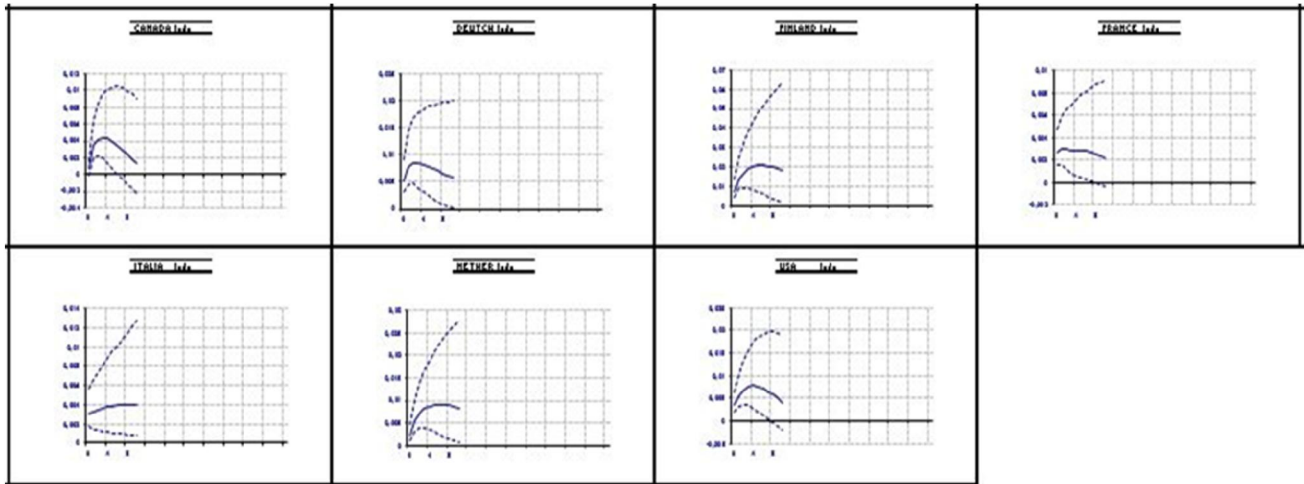
Panel D: Investment model: investors sentiment



**Panel E: Investment model: Investment**



**Panel F: Investment model: GDP**



**Figure 10** reports the GIRFs following a positive shock on European government revenue. GIRFs are obtained following the estimation of the GVAR model presented in eq. (10). The first three panels present the results for the consumption model while the last three panel presents the GIRFs on the investment variables. Each panel present the effect of the shock for each countries. Investment models have less countries because of the limited availability of the investor sentiment variable at the country level. The solid line represent the GIRFs estimates while the dotted lines are the associated confidence intervals.

**Table 1. Variables of the model**

<b>Variable Name</b>	<b>Description</b>	<b>Source</b>
<b>Economic policy variables</b>		
<b>LMPOS</b>	U.S. Treasury securities held by the Federal Reserve: All Maturities, millions of US Dollars.	Federal Reserve Bank of St Louis
<b>LMPEURO</b>	Banking system's liquidity from the consolidated financial statement of the Eurosystem millions of US Dollars.	European Central Bank
<b>LGOVEXP</b>	Total general government expenditures minus interest payments and transfers and subsidies in billions of US Dollar (Baum, Poplawski-Ribeiro and Weber, 2012)	IMF-IFS
<b>LGOVREVN</b>	Total revenue (including taxes and social contributions) in billions of US Dollar.	IMF-IFS
<b>Sentiment variables (IS)</b>		
<b>NIPO</b>	The log of the number of IPO over the period	Bloomberg
<b>PVOL</b>	Volatility premium: the monthend log of the ratio of the value-weighted average market-to-book ratio of high volatility stocks to that of low volatility stocks. High (low) volatility denotes one of the top (bottom) three deciles of the variance of the previous month's daily returns. Total volatility is defined as the standard deviation of the trailing 23 days of daily returns and to control for any association with beta, we compute PVOL based only on beta-adjusted idiosyncratic volatility.	Datastream
<b>TURN</b>	Turnover: measured as is the log of total market turnover: the total dollar volume over the month divided by total capitalization at the end of the prior month. We detrend this with a 36 months moving average. Following Baker, Wurgler and Yan (2012), we detrend the variable.	Datastream
<b>LCCI</b>	The consumer confidence index (CCI) is based on households' plans for major purchases and their economic situation, both currently and their expectations for the immediate future, in logarithm.	OECD
<b>Macroeconomic variables</b>		
<b>LCONS</b>	Private consumption, millions of US Dollars PPP, seasonally adjusted.	OECD
<b>LINVEST</b>	Gross fixed capital formation, millions of US Dollars PPP, seasonally adjusted.	OECD
<b>LGDP</b>	Gross domestic product, millions of US Dollars PPP, seasonally adjusted.	OECD

All economic policy and macroeconomic variables are in logarithm

**Table 2. Variance decomposition associated with monetary shocks**

Horizon	Panel a: US Quantitative easing			Panel b: European Credit easing		
	LCCIU	LCONSUS	LGDPUS	LCCIU	LCONSUS	LGDPUS
1	12.18	2.82	1.36	1.39	2.77	1.70
2	15.73	6.49	3.35	2.24	3.60	3.81
3	19.54	11.90	7.85	3.26	4.46	6.27
4	23.22	18.12	14.73	4.27	5.27	8.25
8	34.59	41.17	42.35	7.15	7.45	11.69
	LCCIEURO	LCONSEURO	LGDPPEURO	LCCIEURO	LCONSEURO	LGDPPEURO
1	5.34	2.92	2.55	1.97	2.14	1.56
2	4.76	3.52	2.98	2.43	2.00	1.59
3	4.33	4.12	3.25	3.06	2.25	1.75
4	4.06	4.63	3.36	3.74	2.45	1.97
8	4.69	5.42	3.48	5.89	3.09	3.00
	LCCICAN	LCONSCAN	LGDPKAN	LCCICAN	LCONSCAN	LGDPKAN
1	15.84	4.13	1.64	1.45	1.21	2.46
2	18.97	4.01	8.07	2.31	2.13	2.53
3	21.56	4.19	17.35	3.47	3.52	2.69
4	23.51	4.66	26.05	4.70	4.99	2.85
8	24.75	9.37	44.96	8.39	8.45	3.90
	ISUS	LINVESTUS	LGDPUS	ISUS	LINVESTUS	LGDPUS
1	3.03	1.91	1.53	1.36	2.37	5.03
2	3.23	2.83	3.36	1.87	11.18	9.36
3	3.45	6.30	7.70	2.50	20.79	13.49
4	3.69	12.20	14.14	3.01	29.10	17.09
8	4.55	38.22	40.45	4.24	47.76	26.04
	ISEURO	LINVESTEURO	LGDPPEURO	ISEURO	LINVESTEURO	LGDPPEURO
1	1.15	1.53	2.42	1.27	5.79	6.29
2	1.35	1.98	3.07	1.52	6.15	5.45
3	1.67	2.63	3.98	1.84	5.90	4.76
4	2.03	3.46	5.09	2.11	5.43	4.24
8	3.58	8.87	11.72	2.93	4.15	3.90
	ISCAN	LINVESTCAN	LGDPKAN	ISCAN	LINVESTCAN	LGDPKAN
1	4.15	1.45	1.33	1.26	1.24	5.07
2	6.70	1.95	4.08	2.84	1.37	5.78
3	9.33	2.97	10.18	3.72	1.59	6.07
4	11.89	4.38	18.55	4.26	1.88	6.22
8	20.64	11.94	41.35	5.40	3.29	6.60

Table 2 reports the variance decompositions obtained from the estimation of model (4) using for each variable in the three countries/region (U.S, Europe and Canada) following a shock in U.S quantitative easing (panel a) and European credit easing (panel b). The first half of the Table reports the variance decompositions from consumption models specified as (6a). The second half of the Table reports the variance decomposition for investment models specified as (6b)

**Table 3. Variance decomposition associated with government expenditures shocks**

Horizon	U.S. government expenditures			European government expenditures		
	CCIUS	CONSUS	GDPUS	CCIEURO	CONSEURO	GDPEURO
1	3.29	0.82	2.36	1.70	4.97	1.11
2	12.89	1.49	2.56	2.94	5.70	1.48
3	14.46	1.84	3.41	4.36	5.55	1.40
4	15.30	2.43	4.71	5.83	4.96	1.12
8	15.90	5.45	9.23	11.30	2.39	0.92
	CCIEURO	CONSEURO	GDPEURO	CCIEURO	CONSEURO	GDPEURO
1	0.83	0.44	0.22	0.21	2.01	0.63
2	1.40	0.57	0.95	0.20	3.46	0.58
3	1.63	0.58	1.37	0.21	4.81	0.53
4	1.76	0.58	1.75	0.24	5.93	0.47
8	1.95	0.74	2.80	0.42	7.64	0.40
	CCICAN	CONSCAN	GDPCAN	CCICAN	CONSCAN	GDPCAN
1	1.19	7.79	6.21	0.57	0.35	0.34
2	6.34	25.20	10.25	0.50	0.59	0.25
3	7.41	28.92	13.90	1.04	0.92	0.23
4	7.92	30.71	16.52	2.04	1.25	0.24
8	8.14	33.01	21.42	7.60	1.78	1.33
	ISUS	INVESTUS	GDPUS	ISUS	INVESTUS	GDPUS
1	1.75	1.04	1.71	0.26	2.00	0.55
2	3.83	2.62	2.09	0.47	3.72	0.48
3	3.96	2.60	1.99	0.73	5.67	0.64
4	4.00	2.53	1.96	0.97	7.70	0.88
8	4.06	2.34	2.21	1.84	15.25	2.30
	ISEURO	INVESTEURO	GDPEURO	ISEURO	INVESTEURO	GDPEURO
1	0.53	0.95	1.19	0.47	0.29	1.05
2	1.11	1.07	1.10	0.73	0.57	1.18
3	1.17	1.05	0.97	1.05	0.95	1.19
4	1.17	0.99	0.89	1.30	1.31	1.18
8	1.18	0.92	0.83	1.88	2.01	1.18
	ISCAN	INVESTCAN	GDPCAN	ISCAN	INVESTCAN	GDPCAN
1	4.71	1.26	1.28	0.25	0.37	0.25
2	11.45	2.28	2.12	0.81	1.16	0.63
3	11.94	2.38	2.45	1.34	2.90	1.10
4	11.83	2.42	2.67	1.78	5.30	1.58
8	10.79	2.53	3.10	2.83	14.48	2.87

Table 3 reports the variance decompositions obtained from the estimation of model (4) using for each variable in the three countries/region (U.S, Europe and Canada) following a shock in U.S (panel a) and European (panel b) government expenditure (panel b). The first half of the Table reports the variance decompositions from consumption models specified as (6a). The second half of the Table reports the variance decomposition for investment models specified as (6b).

**Table 4. Variance decomposition associated with government revenue shocks**

Horizon	U.S. government revenues			Europe government revenues		
	CCIUS	CONSUS	GDPUS	CCIUS	CONSUS	GDPUS
1	1.98	23.65	18.62	0.74	15.02	3.37
2	1.96	24.92	20.27	1.94	14.80	4.35
3	2.05	25.40	20.26	3.54	13.35	4.01
4	2.25	24.61	18.85	5.42	11.47	3.31
8	3.24	18.23	12.38	13.67	5.49	1.78
	CCIEURO	CONSEURO	GDPEURO	CCIEURO	CONSEURO	GDPEURO
1	4.61	2.84	7.07	4.77	2.87	4.30
2	6.04	4.89	10.25	3.51	4.83	4.19
3	7.61	7.59	13.62	2.75	6.64	3.90
4	9.17	10.81	17.16	2.30	8.10	3.54
8	14.02	27.02	31.36	2.13	10.47	2.17
	CCICAN	CONSCAN	GDPCAN	CCICAN	CONSCAN	GDPCAN
1	30.15	4.86	8.62	4.78	0.19	1.06
2	33.94	7.27	16.47	3.29	0.25	3.72
3	36.25	9.83	24.24	2.55	0.43	5.34
4	37.59	12.62	31.08	2.70	0.80	5.68
8	38.30	25.87	46.85	6.98	2.94	3.85
	ISUS	INVESTUS	GDPUS	ISUS	INVESTUS	GDPUS
1	1.06	19.75	34.95	0.23	0.30	1.98
2	1.28	22.33	42.18	0.34	1.26	1.12
3	1.53	24.45	47.85	0.47	3.39	1.52
4	1.71	26.13	52.09	0.59	6.30	2.27
8	2.10	30.08	59.88	0.95	18.67	8.17
	ISEURO	INVESTEURO	GDPEURO	ISEURO	INVESTEURO	GDPEURO
1	0.49	0.51	4.18	0.42	2.25	7.04
2	0.52	1.55	5.65	0.67	4.78	7.07
3	0.55	3.20	7.07	0.97	7.15	6.78
4	0.58	5.32	8.57	1.21	9.12	6.33
8	0.67	15.86	14.58	1.85	11.58	4.44
	ISCAN	INVESTCAN	GDPCAN	ISCAN	INVESTCAN	GDPCAN
1	1.06	6.06	11.76	0.36	0.82	3.88
2	1.70	12.09	21.57	2.71	3.88	4.70
3	2.19	19.19	30.24	4.30	7.64	5.07
4	2.52	26.25	37.01	5.32	11.14	5.21
8	3.67	45.85	50.31	6.96	20.31	4.92

Table 4 reports the variance decompositions obtained from the estimation of model (4) using for each variable in the three countries/region (U.S, Europe and Canada) following a shock in U.S (panel a) and European (panel b) government revenue (panel b). The first half of the Table reports the variance decompositions from consumption models specified as (6a). The second half of the Table reports the variance decomposition for investment models specified as (6b).

## **Appendix**

### **Construction of the investors' sentiment Index**

The investors' sentiment index is constructed following a methodology as similar as possible to Baker, Wurgler and Yan (2012) and Baker and Wurgler (2006). Baker Wurgler and Yan (2012) obtain an annual measure whereas we construct the index at the quarterly frequency. The methods related sentiment to IPOs, turnover and volatility on financial markets. We retain three variables: the number of IPOs (NIPO), volatility premium (PVOL) and turnover (TURN). The specific way to obtain each is detailed in table 1. Filters applied on the data universe for each variable are minimally invasive and based on the original paper Baker, Wurgler and Yuan (2012). For NIPO, we include all available IPOs over the period with available data on returns. Based on our data, we forego RIPO (short term return on IPOs) at the international quarterly level because the principal component analysis results suggested to keep solely three factors. In the original paper, BWY had a similar case for Germany. In fact, this result can be associated to the quarterly frequency and the fact that BWY use meta data for IPOs in their paper. In this paper, we opt for a more tracktable and internationally uniform option and only use a single database (Bloomberg). The number of IPOs quarterly was low in some countries/quarters and sometimes zero which was misleading in terms of returns. For PVOL, we eliminate negative market-to-book ratios. We also filter out the top 1% of the MTBV in order to exclude extreme observations such as MTBV of 600 for example. We treat those as missing values. We exclude inactive stocks defined as a stock with a cumulative return of 0% until the end of the period covered by the database. Finally, for TURN, we exclude missing values and inactive stocks.

In order to control for the impacts of macroeconomic conditions on the building blocks, we follow Baker and Wurgler (2006) and orthogonalise each components with respect to six macro proxies: Consumption growth, industrial production growth, inflation, employment growth and term growth. All macroeconomic data are extracted from Bloomberg. As in the original paper, the macro proxy explain little of the sentiment components. The orthogonal variables are correlated by about 0.8 on the original variables. The sentiment index for each country and region is obtained by applying the principal component analysis on the three components. The sentiment variable is thus a linear function of the three components multiplied by the first principal component.



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